SUMMARY
SUMMARY
SUMMARY
SUMMARY
SUMMARY
SUMMARY
SUMMARY
SUMMARY
SUMMARY
SUMMARY
SUMMARY

FINAL: Environmental Statement
Crude Oil Transportation Systems

Proposed by : NORTHERN TIER PIPELINE COMPANY
KITIMAT PIPE LINE LTD.
NORTHWEST ENERGY COMPANY
TRANS MOUNTAIN OIL PIPE LINE CORPORATION.

SUMMARY

TABLE OF CONTENTS

TABLES

FIGURES

INTRODUCTION

Over the past 25 years oil has replaced coal as the major source of energy in the United States. This growing demand, combined with the decline of domestic production, has forced oil imports up from about 15 percent of total U.S. consumption in 1971 to 44 percent in 1977. The resulting reliance on foreign oil supplies has created national security and balance of payment problems which have been aggravated since world oil prices began rising rapidly in 1973.

A large part of crude oil imports supplying the northern tier states (Washington, Oregon, Idaho, Montana, North Dakota, Minnesota, Michigan, Wisconsin, Illinois, Indiana, and Ohio) has traditionally come from western Canadian sources through pipelines to Washington, Montana, North Dakota, and Minnesota. Canadian oil shipments constituted 45 percent of total U.S. oil imports in 1971 and peaked at 1.108 million barrels per day in 1973. In 1974 the Canadian government decided to eliminate oil exports and began a program of gradual cutbacks designed to stop all deliveries to the United States by 1982. In September, 1978 the Canadian National Energy Board revised the schedule of these reductions, announcing the intention to maintain exports to the United States at the level of 55,000 barrels per day until 1982.

Efficient utilization of Alaska north slope (ANS) crude oil has been complicated by its chemical properties and the configuration of existing transportation systems and refining facilities.

ANS crude is a heavy oil - a low gravity petroleum containing more sulfur than so-called sweet crude. Heavier crudes yield less gasoline and more residual products such as bunker fuel and asphalt than the lighter ones, unless special processes are used. In addition, capital equipment and refining costs are considerably higher for heavy crude than for sweet crude.

Very few refineries can process ANS crude exclusively. Most can handle varying proportions of sour crude when mixed with low sulfur sweet crude from Algeria, Indonesia, Libya, or Nigeria. Refineries could be retrofitted to process only ANS crude, but their conversion would cost hundreds of millions of dollars.

As most west coast refineries are not designed to process large volumes of heavy crude, the amount of ANS crude they can utilize is limited. As a result, there was a 500,000 to 600,000 barrels per day surplus of ANS crude to west coast refinery capacity during 1978. This surplus is expected to increase when the Trans-Alaska Pipeline throughput is raised from 1.2 to 1.5 million barrels per day in December 1979.

The efficient utilization of ANS crude oil is further complicated by the absence of a transportation system that can efficiently move large volumes of Alaskan and foreign crudes from west coast ports to markets in the northern tier and inland states. At present the ANS crude surplus to west coast refineries is being shipped by tanker through the Panama Canal to terminals and refineries on the Gulf of Mexico and the east coast and pumped inland through existing pipelines. Although workable, this system is both slow and expensive.

Despite recent discoveries in Williston Basin (North Dakota) and southwestern Wyoming, oil production in the northern tier, Rocky Mountain, and midwest regions is declining. This, combined with the impending shut-off of Canadian imports and the lack of adequate transportation facilities, is expected to result in a critical

shortage of crude oil in the northern tier states during the next 20 years. The exact amount of this future shortfall is a subject of continuing debate but is generally thought to be between 375,000 and 700,000 barrels per day.

In response to this increasing demand, several proposals have been made to construct crude oil transportation systems for delivering ANS and foreign crude oil from the west coast to the northern tier and inland states. One of the first of these was submitted by the Northern Tier Pipeline Company (NTPC). On April 18, 1977, NTPC applied for a right-of-way permit under Title I of the Mineral Leasing Act of 1920 as amended for a pipeline to cross federal lands between Port Angeles, Washington and Clearbrook, Minnesota. Preparation of an environmental statement (ES), as required by the National Environmental Policy Act of 1969 (NEPA), was assigned to the Bureau of Land Management and resulted in a draft environmental statement (DES) being issued on January 11, 1979.

During the final stages of preparation of the DES, President Carter signed Public Law 95-617, the Public Utility Regulatory Policies Act of 1978 (PURPA). Title V of PURPA addressed crude oil transportation and provided for: 1) supplying northern tier and inland states crude oil through the selection of delivery systems to these areas; 2) expediting action on applications for all federal permits, licenses, and approvals required for construction and operation of such systems; and 3) coordinating federal and state decisions toward this end.

PURPA also established 16 criteria upon which a Presidential decision of a crude oil transportation system would be based. The first criterion, and the one which this Environmental Statement is specifically designed to address, concerns the environmental impacts of the proposed systems and their capability of minimizing environmental risks resulting from the transportation of crude oil. The other 15 criteria assess the economic aspects of the proposals; their impacts upon national security and international relations; the safety, efficiency, and dependability of design; and the amount of oil which would be delivered to northern tier states. A report discussing all 16 criteria is being prepared by the Department of the Interior and is scheduled to be submitted to the President in October 1979.

Northern Tier Pipeline Company (NTPC), Northwest Energy Company (NEC), Kitimat Pipe Line Ltd. (KPL), and Trans Mountain Oil Pipe Line Corporation (TMC) submitted crude oil transportation system proposals to the Secretary of the Interior for consideration under the provisions of Title V of PURPA. In the draft Environmental Statement, the proposals of NEC, KPL, and TMC were treated as alternatives to the NTPC system. After consultation with the Council on Environmental Quality, the Department of the Interior determined that it was acceptable to treat all Title V applicants as proposals in the final Environmental Statement (FES).

Executive Order 12114 of January 4, 1979 (EO 12114), "Environmental Effects Abroad of Major Federal Actions," directed that environmental statements need not be prepared on actions within foreign nations. Therefore, those proposals or parts of proposals within Canada have not been given in-depth analysis in this FES, but have been briefly described to provide a comparatively full view of the applications.

The FES has been organized as follows:

Chapter 1 has been expanded to include a description of each of the Title V proposals.

Chapters 2 through 7 cover the same material as the DES and pertain only to the NTPC proposal (Description of the Environment, Environmental Impacts of the Proposal, Mitigating Measures Not Included in the Proposal, Any Adverse Impacts that Cannot Be Avoided Should the Proposal Be Implemented, The Relationship Between Local Short-term Uses of Man's Environment and the Maintenance and Enhancement of Long-term Productivity, Irreversible and Irretrievable Commitment of Resources).

Chapter 8 addresses the NEC, KPL, and TMC proposals in a manner and sequence similar to Chapters 2 through 7 of NTPC. It also summarizes all Title V proposals.

Chapter 9 discusses alternatives presented by all Title V applicants as well as others identified by the environmental statement team. The chapter also considers alternatives within and beyond the scope of the PURPA proposals.

Chapter 10 describes consultation and coordination efforts undertaken by the environmental statement team while preparing the DES and FES. It also contains comments on the DES and environmental statement team responses to those comments.

The FES contains a glossary, bibliography, and map addendum.

DESCRIPTION OF PROPOSALS

This section contains the following information:

- A map showing the routes of all four Title V proposals.
- A description and map of the NTPC proposal
- A description and map of the NEC proposal
- A description and map of the KPL proposal
- A description and map of the TMC proposal
- A tabular comparison of design features and costs of the four proposals (table 1).

Proposed Crude Oil Transportation Systems

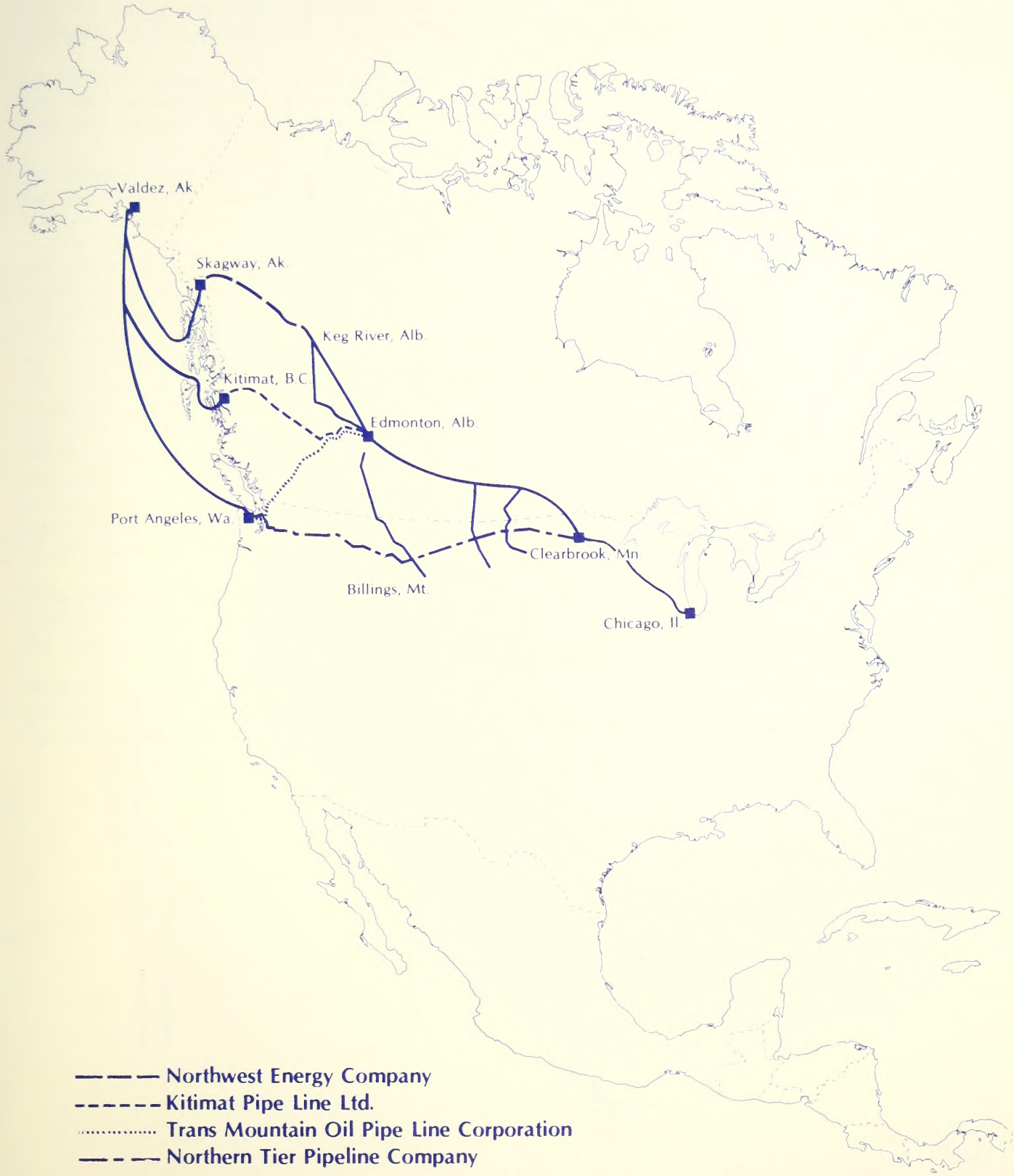
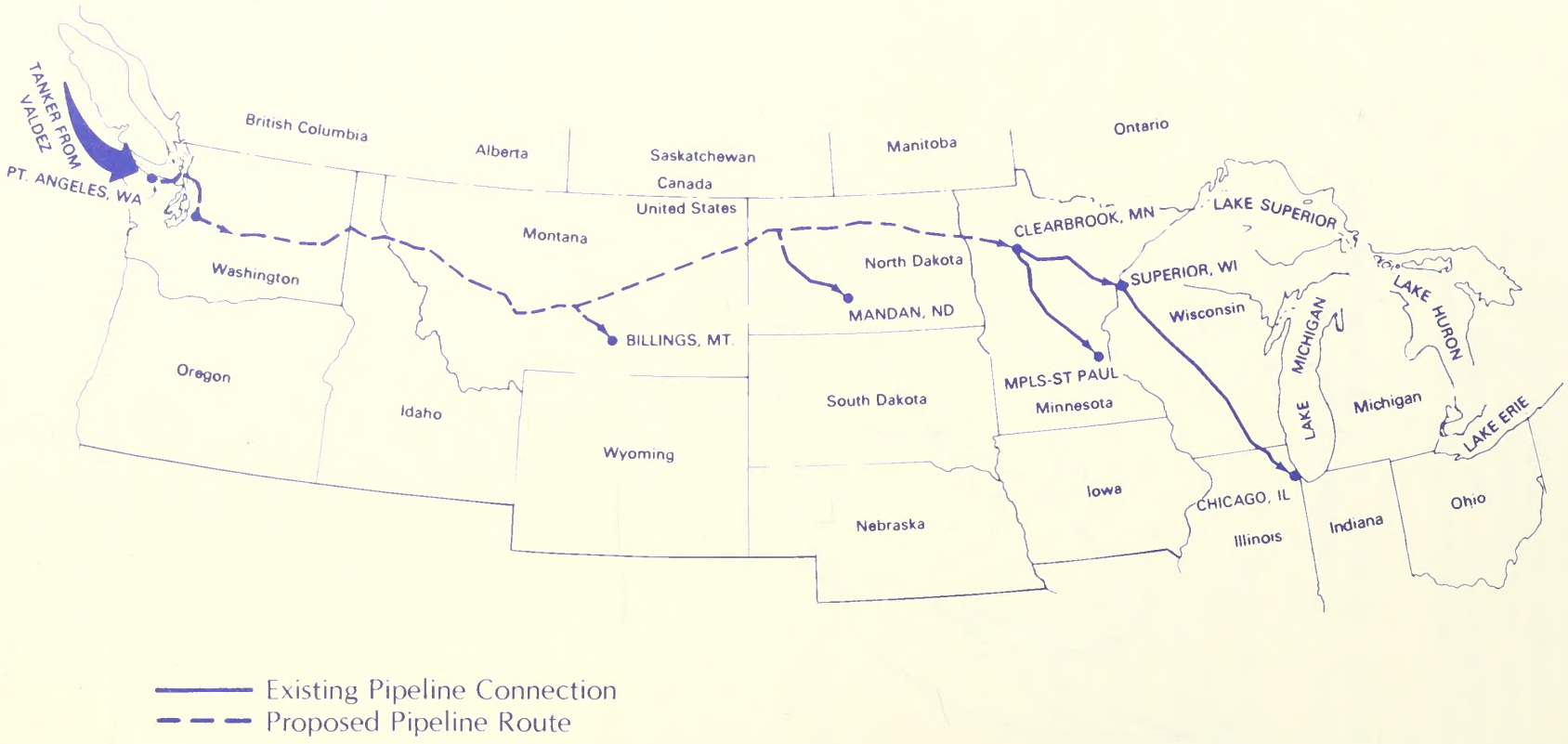


Figure 1

Figure 2

Northern Tier Pipeline Company Proposal



Existing Pipeline Connection
Proposed Pipeline Route

Northern Tier Pipeline Company Proposal

The Northern Tier Pipeline Company filed application with the Department of the Interior on December 8, 1978, under Title V of the Public Utility Regulatory Policies Act of 1978, to construct and operate a crude oil transportation system from Port Angeles, Washington to Clearbrook, Minnesota.

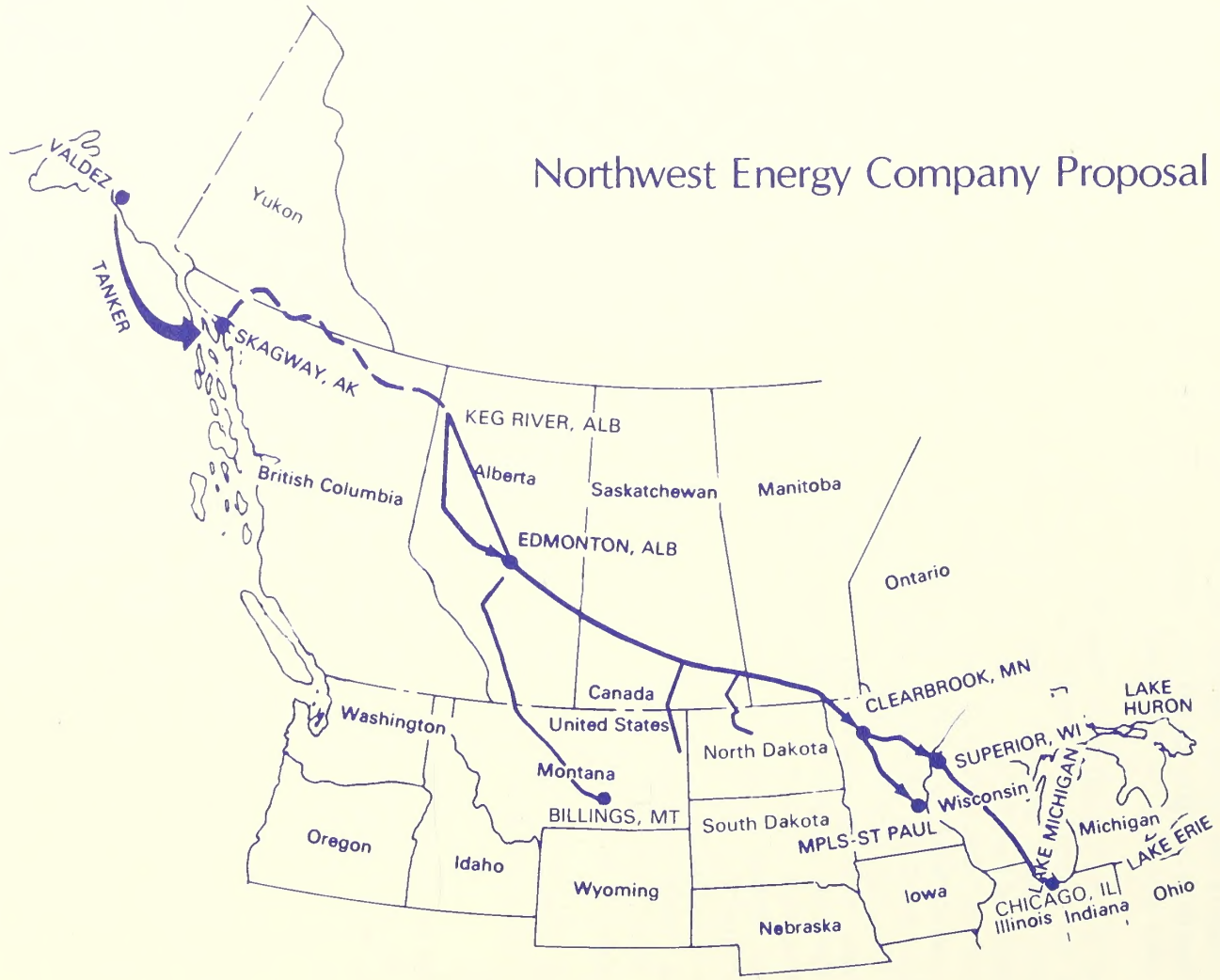
Throughput capacities would be 709,000 barrels per day initially and 933,000 barrels per day ultimately. The pipeline system could be expanded to supply an additional 350,000 barrels per day to existing refineries in the Puget Sound area.

The fixed-berth port would be located in Port Angeles harbr on Ediz Hook and would be designed to accommodate tankers in the 18,000 to 300,000 dead weight ton class. Tanker traffic would average about 300 port calls per year initially and 395 port calls per year ultimately. The onshore storage facilities would be located on a 242-acre site on Green Point, approximately 6 miles east of Port Angeles, and would include 11 tanks with a total storage capacity of 6 million barrels initially and 18 tanks with a total storage capacity of 10 million barrels ultimately. Two 5.2 mile submarine pipelines under Port Angeles Harbor would connect the port facility to the onshore storage facility. The pipeline system would consist of 1,491 miles of 40-and 42-inch diameter pipe and would be located entirely within the United States. From the onshore storage facility the pipeline would cross beneath Puget Sound in two segments for a total of 22.5 miles, proceed generally east through central Washington, the northern Idaho panhandle, central Montana, northern North Dakota, and terminate in northwest Minnesota at Clearbrook. At Clearbrook it would connect with existing pipelines that supply crude oil to refineries in Minnesota, Wisconsin, and Illinois. NTPC proposes delivery facilities at 3 pipeline crossings in Montana and North Dakota.

The pipeline would be located adjacent to existing transportation and utility corridors for approximately 500 miles. A 75-foot permanent pipeline right-of-way would be required.

Project costs would be approximately $1.2 billion for the initial throughput capacity phase and an additional $43 million for the ultimate throughput capacity phase. Construction would require about 2 years.

Figure 3


Northwest Energy Company Proposal
VALDEZ
TANKER
Yukon
SKAGWAY, AK
KEG RIVER, ALB
British Columbia
Alberta
Saskatchewan
Manitoba
EDMONTON, ALB
Ontario
CLEARBROOK, MN
LAKE HURON
Canada
United States
Washington
Montana
North Dakota
SUPERIOR, WI
LAKE MICHIGAN
Wisconsin
BILLINGS, MT
South Dakota
MPLS-ST PAUL
Michigan
LAKE ERIE
Oregon
Idaho
Wyoming
Iowa
CHICAGO, IL
Illinois
Indiana
Ohio
Nebraska
Existing Pipeline Connection
Proposed Pipeline Route

Northwest Energy Company Proposal

The Northwest Energy Company filed application with the Department of the Interior on December 8, 1978, under Title V of the Public Utility Regulatory Policies Act of 1978 to construct and operate a crude oil transportation system from Skagway, Alaska to Keg River, Alberta, Canada.

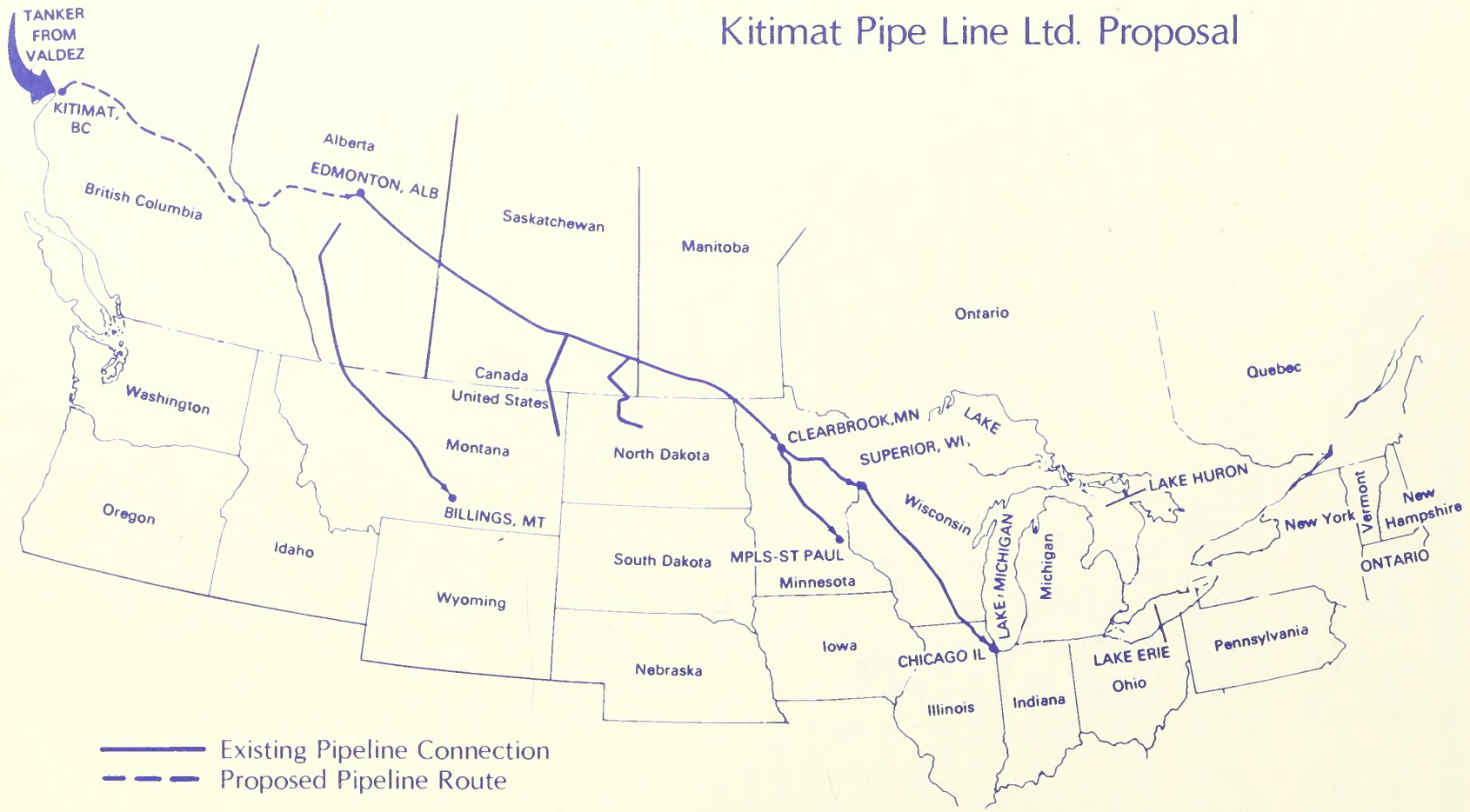
Throughput capacities would be 530,000 barrels per day initially and could be increased to 750,000 barrels per day ultimately through the installation of additional pumps and pump stations.

The fixed-berth port would be located at Skagway and would be designed to accommodate tankers up to the 225,000 dead weight ton class. Tanker traffic would average about 206 port calls per year. The onshore storage facility would be located on a 73-acre site approximately 1 mile north of Skagway and would include 8 tanks with a total storage capacity of 4 million barrels. The site is currently being used for storage of petroleum products. A 3.5 mile buried pipeline would connect the port facility to the onshore storage facility. The pipeline system would consist of 710 miles of 34- and 36-inch diameter pipe. The first 14 miles would be in Alaska and the remaining 696 miles would be in Canada. From the onshore storage facility the pipeline would proceed in a northerly direction for 14 miles to the Alaska-British Columbia border. It would then proceed generally east, cross the northwest corner of British Columbia, the southern portion of the Yukon Territory, the northeast corner of British Columbia and terminate in northwest Alberta at Keg River. From Keg River, Alberta, crude oil would be delivered through existing systems to northern tier states. In order to provide crude oil to Montana refineries, approximately 70 miles of pipeline would have to be constructed from Edmonton south to Rimbey, Alberta, to tie into the Rangeland Pipeline.

The pipeline would be located adjacent to an existing railroad right-of-way for approximately 11 miles in Alaska and adjacent to existing transportation and utility corridors for approximately 400 miles in Canada. In Alaska, the permanent pipeline right-of-way would be 45 feet in segments adjacent to the railroad right-of-way and 75 feet in other segments.

Project costs would be approximately $919 million for the initial throughput capacity phase. Approximately $219 million would be required for construction of the United States portion and approximately $700 million for the Canadian portion. Construction would require about 2 years.

Figure 4


Kitimat Pipe Line Ltd. Proposal
TANKER FROM VALDEZ
KITIMAT, BC
British Columbia
Alberta
EDMONTON, ALB
Saskatchewan
Manitoba
Ontario
Quebec
Canada
United States
Washington
Oregon
Idaho
Montana
Wyoming
BILLINGS, MT
North Dakota
South Dakota
Nebraska
MPLS-ST PAUL
Minnesota
Iowa
CLEARBROOK,MN
LAKE SUPERIOR, WI,
Wisconsin
Illinois
CHICAGO IL
LAKE MICHIGAN
Michigan
Indiana
LAKE HURON
LAKE ERIE
Ohio
Pennsylvania
New York
Vermont
New Hampshire
ONTARIO
Existing Pipeline Connection
Proposed Pipeline Route

Kitimat Pipe Line Ltd. Proposal

Kitimat Pipe Line Ltd. filed application with the Department of the Interior on December 8, 1978, under Title V of the Public Utility Regulatory Policies Act of 1978 to construct and operate a crude oil transportation system from Kitimat, British Columbia, Canada, to Edmonton, Alberta, Canada.

Throughput capacities would be 450,000 barrels per day initially and 900,000 barrels per day ultimately.

The floating-berth port would be located near Kitimat, British Columbia, approximately 500 miles north of Vancouver, British Columbia and would be designed to accommodate tankers up to the 320,000 dead weight ton class. Tanker traffic would average about 84 port calls per year initially and 156 port calls per year ultimately. The onshore storage facility would be located in the vicinity of Kitimat and would include five to nine tanks with a total storage capacity of 3 to 5 million barrels. The pipeline system would consist of 753 miles of 36-inch diameter pipe and would be located entirely in Canada. The pipeline would proceed generally east, cross central British Columbia, and terminate in central Alberta at Edmonton. From Edmonton, crude oil would be delivered through existing systems to the northern tier states. In order to provide crude oil to Montana refineries, approximately 70 miles of pipeline would have to be constructed from Edmonton south to Rimbey, Alberta, to tie into the Rangeland Pipeline.

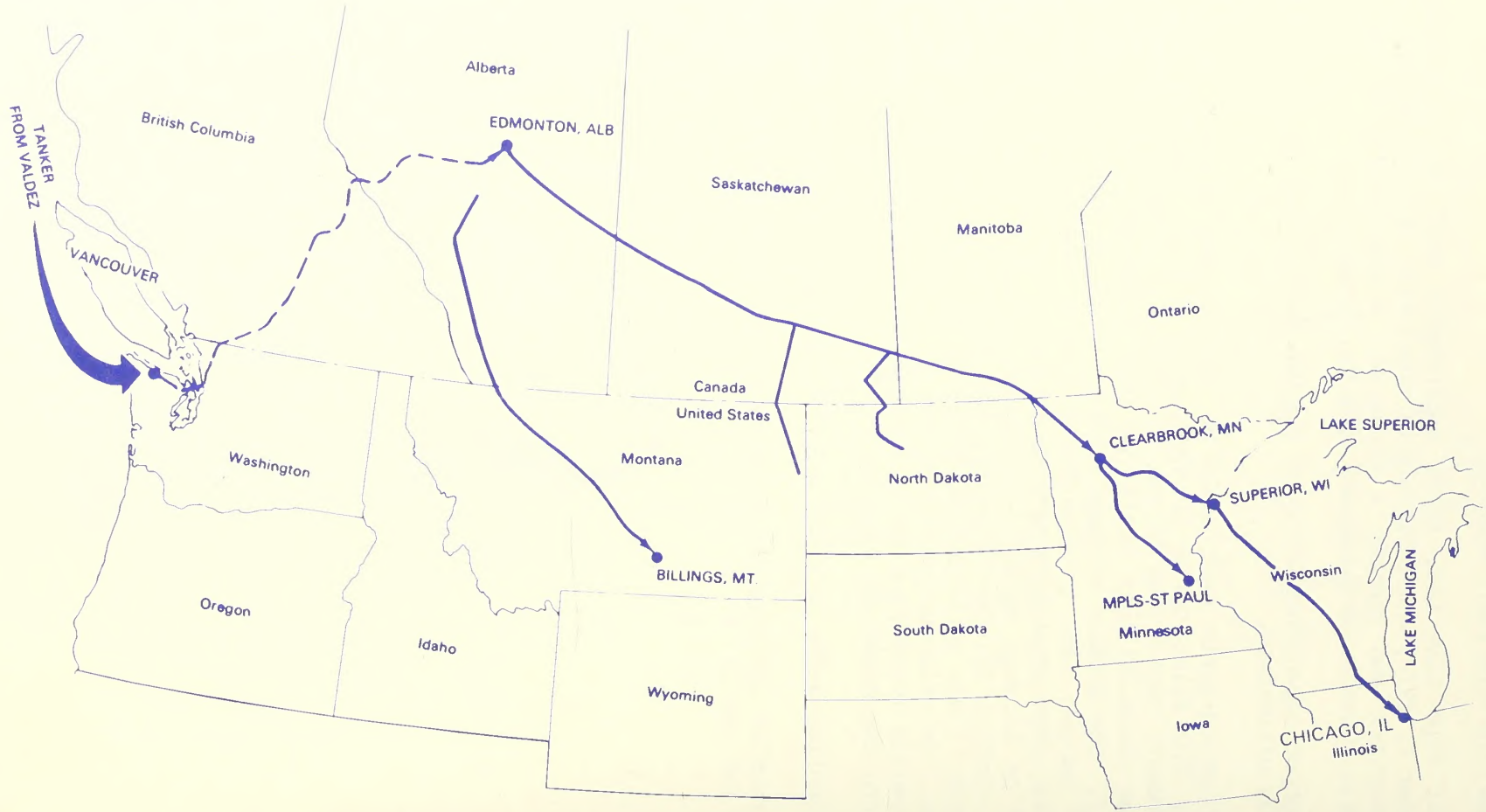
The pipeline would parallel existing highways throughout most of the route.

Construction costs would be approximately $750 million. Construction would require about two years.

Dall Ewe and Lamb

Figure 5

Trans Mountain Oil Pipe Line Corporation Proposal



Trans Mountain Oil Pipe Line Corporation Proposal

The Trans Mountain Oil Pipe Line Corporation filed application with the Department of the Interior on February 6, 1979, under Title V of the Public Utility Regulatory Policies Act of 1978 to construct and operate a crude oil transportation system from Low Point, Washington, to Edmonton, Alberta, Canada.

Throughput capacities would be 500,000 barrels per day initially and 630,000 barrels per day ultimately.

The port would consist of two single point moorings and would be located offshore at Low Point, 18 miles west of Port Angeles, Washington. It would be designed to accommodate tankers up to the 200,000 dead weight ton class. Tanker traffic would average about 205 port calls per year. The onshore storage facility would be located on a 300-acre site at Low Point and would include eight tanks with a total storage capacity of 4 million barrels. Two 2.5 mile submarine pipelines would connect the port to the onshore storage facility. The pipeline system would consist of 823 miles of 30-inch diameter pipe. The first 148 miles would be in Washington and the remaining 675 miles in Canada. From the onshore storage facility the pipeline would proceed east, cross beneath Puget Sound in two segments for a total of 5.5 miles, then proceed north to the Washington-British Columbia border near Sumas, Washington. From there, the pipeline would proceed northeast, cross southeast British Columbia, and terminate in central Alberta at Edmonton. From Edmonton, crude oil would be delivered through existing systems to the northern tier states. In order to provide crude oil to Montana refineries, approximately 70 miles of pipeline would have to be constructed from Edmonton south to Rimbey, Alberta, to tie into the Rangeland Pipeline.

The pipeline would be located within an existing right-of-way for 54 miles in Washington. A 60-foot permanent pipeline right-of-way width would be required. The pipeline would follow an existing right-of-way through Canada.

Projects costs would be approximately $583 million. Two hundred million dollars would be required for the United States portion and $383 million for the Canadian portion. Construction would require about 2 years.

TABLE 1. Major Design Features

Major Design Features	NTPC	NEC	KPL	TMC
Sea leg (nautical miles)				
High seas	1,188	535	556	1,188
Inland waters	61	219	250	42
From Valdez Ak, Total	1,249	754	806	1,230
Maximum tanker size (Dead weight tons)	300,000	225,000	320,000	200,000
Tanker port calls/year				
Initially	300	206	64	205
Ultimately	395	Unknown	156	Unknown
Port site	Port Angeles, Washington	Skagway, Alaska	Kitimat, British Columbia, Canada	Low Point, Washington
Port type	Two fixed berths; no dredging	One fixed berth; no dredging	Two floating berths; no dredging	Two single point moorings; no dredging
Submarine pipelines from port to onshore storage facility (number-length-diameter)	2-5.2 miles-48" or 52"	No submarine pipeline 1-3.5 mile-42" underground line	None	2-2.5 miles-48"
Onshore storage facility location-size	6 miles east of Port Angeles-242 acres	1 mile north of Skagway-73 acres	Near Kitimat Size not identified	18 miles west of Port Angeles at Low Point-300 acres
Storage tanks (capacity in barrels)				
Initially	11-6 million	8-4 million	5-3 million	8-4 million
Ultimately	18-10 million	Unknown	9-5 million	Unknown
Pipeline route	Port Angeles, Washington to Clearbrook, Minnesota	Skagway, Alaska to Keg River, Alberta, Canada	Kitimat, British Columbia to Edmonton, Alberta Canada	Low Point Washington to Edmonton, Alberta, Canada
Pipeline mileage				
U.S.	1,491	14	0	148
Canada	0	696	753	675
Total	1,491	710	753	823

TABLE 1. (Continued)

Major Design Features	NTPC	NEC	KPL	TMC
States and Provinces crossed	Washington, Idaho, Montana North Dakota, Minnesota	Alaska, British Columbia, Yukon Territory, Alberta	British Columbia, Alberta	Washington, British Columbia, Alberta
Pipeline size (diameter-length)	42 inch-800 miles 40 inch 700 miles	34 inch-627 miles 36 inch-83 miles	36 inch-753 miles	30 inch-823 miles
Submarine pipelines (number-length-diameter)	1-18.3 miles -42 inch 1-4.2 miles -42 inch	None	None	1-3.25 miles-30 inch 1-2.25 miles-30 inch
Pipeline parallel to existing utility corridors (miles)	504	11 (U.S.) 400 (Canada)	Most of route	54 (U.S.) 675 (Canada)
Right-of-way width (feet)				
Construction	90	90	90	75
Permanent	75	45 and 75	60	60
Mainline stations				
Initially	18	1 (U.S.) 7 (Canada)	10	3 (U.S.) (Canadian not identified)
Ultimately	21	Not identified	16	Not identified
Throughput volume (barrels per day)				
Initially	709,000	500,000	450,000	500,000
Ultimately	933,000	750,000	900,000	30,000
Additional potential	350,000	None	None	None
Utilization of existing systems	None	1312 miles in Canada	925 miles in Canada	1,027 miles in Canada

TABLE 1. (Continued)

Major Design Features	NTPC	NEC	KPL	TMC
Delivery points in U.S. and volumes in barrels per proposed				
Initially	Montana: 50,000 95,000 North Dakota: 14,000 Minnesota: 550,000	Delivery points other than Minnesota not identified	Delivery points other than Minnesota not identified	Delivery points other than Minnesota not identified
Ultimately	Montana: 60,000 115,000 North Dakota: 18,000 Minnesota: 740,000	Delivery points other than Minnesota not identified	Delivery points other than Minnesota not identified	Delivery points other than Minnesota not identified
Capability of system to supply additonal points in northern tier states	Yes	No	No	Yes
Construction time	2 years	2 years	2 years	2 years
Construction cost estimates by applicants				
U.S. portion				
Initially	$1.2 billion (1978 U.S.)	$219 million (1978 U.S.)	None	$200 million (1979 U.S.)
Ultimately	$43 million additional	Not identified	None	Not identified
Canadian portion				
Initially	None	$700million (1978 $U.S.)	$750million (1977 Can.)	$383million (1979 Can.)
Ultimately	None	Not identified	Not identified	Not identified
Bunker Fuel % sulfur	0.45	0.2	Unknown	2.0
Annual operating costs for initial throughput				
U.S. portion	$49.6 million (1978 $ U.S.)	$10.1 million (1978 $U.S.)	None	$12.0 million (1979 $U.S.)
Canadian portion	None	$29.3 million (1978 $U.S.)	Not identified	$34.3 million (1979 $Can.)

ENVIRONMENTAL IMPACTS

Introduction

Significant environmental impacts would result from the construction, operation, and abandonment of any of the proposed crude oil transportation systems. Impacts to the environment would be both adverse and beneficial.

Generally, the impacts of the proposed four systems would be similar. The incidence, intensity, duration, magnitude, and location of impacts on the environment would be different for each proposal.

The discussion of impacts is limited to those which would occur in the United States. Impacts in Canada are not addressed pursuant to Executive Order 12114 (January 4, 1979). However, it can be assumed that the impacts resulting from the KPL proposal (which is entirely in Canada) and those portions of the NEC and TMC proposals in Canada would be similar to the impacts which would occur in the United States.

Refer to Chapters 3 and 5 of the ES for a discussion of significant impacts of the NTPC proposal and to Chapter 8 for a discussion of impacts of the NEC and TMC proposals. A summary of impacts of the three proposals is tabulated in Chapter 8.

Following are summaries of the significant impacts (table 2) by resource and project phase, for the NTPC, NEC, and TMC proposals for the port and onshore storage facilities and pipeline systems.

Following the summaries is a discussion of major impacts that could result from catastrophies such as oil spill, fire, explosion, and earthquake.

Moose

TABLE 2. Summary of Impacts Port and Onshore Storage Facilities

RESOURCE	NTPC	NEC	TMC
	Port and Onshore Storage Facilities		
Air Quality	Construction		
	On-site increase in pollutant levels should be within standards. Intermittent dust emissions between 0.5 and 2-7 tons per day during an 18 month period could be a nuisance on Green Point.	On-site increase in pollutant levels estimated to be within class II standards.	On-site increase in pollutant levels estimated to be within standards.
	Operation		
	Class I sulfur dioxide standard could be exceeded about 10 days annually at Olympic National Park.	Potential to approach class II maximums for sulfur dioxide about 10 days a year.	Emissions estimated to be approximately the same as for NTPC.
	Abandonment		
	Similar to construction.	Similar to construction.	Similar to construction.
Noise	Construction		
	Annoying noise levels during 18 months in vicinity of Ediz Hook and Green Point.	Moderate, noticeable increase in noise levels related mostly to pile driving and blasting operations.	Moderate, noticeable increase in noise levels.
	Operation		
	Occasional annoying noise levels to residents on Green Point.	Insignificant noise increase.	Insignificant noise increase.
	Abandonment		
	Similar to construction but reduced.	Similar to construction, much reduced.	Similar to construction but reduced.

SUMMARY OF IMPACTS (Continued)

RESOURCE	NTPC	NEC	TMC
Topography	Construction		
	Alteration of bluff and 140 acres on Green Point and 19 acres on Ediz Hook facility.	Alteration of 116 acres, 62 of which are already used as a storage facility.	Alteration of up to 300 acres including scar on bluff.
	Abandonment		
	Scar on bluff would remain.	No Significant impacts.	Scar on bluff would remain.
Geology	Construction		
	Increased potential for landslides at Green Point.	Increased slide and rockfall potential at port and along 2,500 feet of pipe-line to onshore storage facility.	Increased potential for land slide in unstable areas.
Soils	Construction		
	140 acres soil disturbance at Green Point. Low water erosion potential at rate of 1.4 to 3.2 tons per acre per year.	116 acres soil disturbance. Low estimated water erosion loss.	Up to 300 acres soil disturbance. Low estimated water erosion loss.
Aquatic Resources Physical Components	Construction		
	Perched water table removed. Temporary increase in turbidity and sediment in Siebert Creek.	Flows into Skagway River could be altered. Minor sediment increase in Skagway River.	Temporary increase in turbidity in Murdock and Suzie River and Lyre River.
	Operation		
	Minor degradation of water quality in Siebert Creek from effluent discharge.	Minor degradation of water quality in Skagway River from effluent discharge.	No significant Impacts.
Biological Components	Construction		
	No significant impacts.	Minor reduction of salmon and trout populations in Skagway River.	No significant impacts.

SUMMARY OF IMPACTS (Continued)

RESOURCE	NTPC	NEC	TMC
Marine Resources	Operation		
	No significant impacts.	Minor reduction of salmon and trout populations in Skagway River from effluent discharge.	No significant impact.
	Construction		
	Disturbance of harbor bottom and degradation of marine water quality from laying two-5 mile submarine pipelines.	Minor impacts from berth construction.	Disturbance of bay bottom and degradation of marine water quality from laying two-2.5 mile submarine pipeline.
Biological Components	Operation		
	Degradation of marine water quality from small chronic oil spills.	Degradation of marine water quality from small chronic oil spills.	Degradation of marine water quality from small chronic oil spills.
	Construction		
	Loss of some shellfish in Port Angeles-Green Point-Dungeness Spit area.	Minor impacts from berth construction.	Disturbance to marine mammals and water fowl.
	Operation		
	Loss of shellfish and finfish from small chronic oil spills.	Loss of shellfish and finfish from small chronic oil spills. Ship traffic could interfere with migration of the endangered humpback whale.	Loss of shellfish and finfish from small chronic oil spills.
Terrestrial Vegetation	Construction		
	159 acres of natural vegetation removed from Ediz Hook and Green Point.	Up to 116 acres of vegetation removed including about 10 acres of low grade timber.	Up to 300 acres of natural vegetation removed.

SUMMARY OF IMPACTS (Continued)

RESOURCE	NTPC	NEC	TMC
	Operation		
	No regrowth of timber for life of project.	No regrowth of timber for life of project.	No regrowth of timber for life of project.
Terrestrial Wildlife 	Construction		
	Bald eagle roosting habitat removed on Green Point. Wildlife habitat on 242 acres removed.	None identified.	Removal of up to 300 acres of wildlife habitat.
	Operation		
	Eagles would avoid Green Point feeding, roosting, and nesting areas. Wildlife would avoid vicinity.	No significant impacts.	Precluded wildlife use on 300 acres.
Cultural Resources 	Construction		
	Possible destruction of previously unknown fossil deposits and historical and archaeological sites.	Possible destruction of previously unknown fossil deposits and historical and archaeological sites.	Two documented sites at Low Point would be removed.
Land Use 	Construction		
	Displacement of 110 acres of log storage pilot station, marina and boat ramp, Vertical Omni Range Station. 242 acre site changed from forest to industrial use.	Change 10 acres of low grade timber forest to industrial site.	Loss of up to 300 acres of pasture and woodland. Three households displaced; 300 acre site changed from pasture, woodland, residential use to industrial use.
Transportation and Utility Networks 	Construction		
	190 percent increase in vessel traffic in Port Angeles harbor. Significant increase in vehicle traffic in Port Angeles area.	Increased barge traffic could cause significant traffic problem within the port.	Increased vessel traffic in Strait of Juan de Fuca. Substantial increase in traffic on roads in Port Angeles.

SUMMARY OF IMPACTS (Continued)

RESOURCE	NTPC	NEC	TMC
	Operation		
	Electric power requirements would significantly aggravate potential power shortage	No significant impacts.	Electric power requirements would aggravate a potential power shortage.
Social Conditions	Construction		
	Temporary strains on housing, sewer and water systems, police and fire protection in Port Angeles and Clallam County.	Large population increase in Skagway. Severe strains on housing, public utilities, and public services especially sewer and water systems.	Temporary strains on housing, police, and fire protection in Port Angeles and Clallam County.
Economic Conditions	Construction		
	Work force in Port Angeles increased by 1,500. Increase in prices of goods, services and rentals. Temporary strain on local government budgets.	Temporary substantial increase in employment. Turnover rate of non-project jobs could be significant. Temporary strain on local government budgets.	Temporary substantial increase in employment and personal income. Temporary strain on local government budgets.
	Operation		
	Increased tax revenue. Substantial increase in personal income.	Substantial increases in tax revenues. Some construction workers remaining could put minor strain on public assistance and family service funds.	Substantial increase in personal income and tax revenues.
	Abandonment		
	Loss of personal income and tax revenue.	Loss of local tax revenue.	Loss of personal income and tax revenue.

SUMMARY OF IMPACTS (Continu

RESOURCE	NTPC	NEC	TMC
	PIPELINE SYSTEM		
Air Quality	Construction		
	Pollutant emissions would be within standards. Fugitive dust emissions along route.	Unquantified increase in pollutant levels estimated to be within standards.	Unquantified increase in pollutant levels estimated to be within standards.
	Operation		
	Localized concentrations of hydrocarbons at transfer and delivery facilities in Montana, North Dakota, and Minnesota within standards.	No significant impacts.	Increase in pollutant levels estimated to be within standards.
	Abandonment		
	Similar to construction but reduced.	Similar to construction but reduced.	Similar to construction but reduced.
Noise	Construction		
	High noise levels in daytime for about one month could annoy some residents.	High noise levels in daytime for about one month.	High noise levels in daytime for about one month could annoy some residents.
	Operation		
	Not excessive.	Not excessive.	Not excessive.
	Abandonment		
	Similar to construction.	Similar to construction.	Similar to construction.
Topography	Construction		
	Significant alteration of landscape on steep slopes and bluffs.	Alteration of landscape on steep slopes and bluffs. Generally follows railroad corridor.	Significant alteration of landscape on steep slopes and bluffs.

SUMMARY OF IMPACTS (Continued)

RESOURCE	NTPC	NEC	TMC
Geology	Construction		
	8,600 to 1.6 million cubic yards per mile geologic material altered. Landslide, rockslide, and rock-fall potential increased by enlargement of cuts in colluvial and bedrock slopes.	Up to 1.2 million. cubic yards per mile of geologic material altered. Landslide, rockslide, and rock-fall potential increased by enlargement of cuts in colluvial and bedrock slopes.	4,700 cubic yards per mile of geologic material altered. Rockslide, and rock-fall potential increased by enlargement of cuts in colluvial and bedrock slopes.
Soils	Construction		
	20,000 acres of soil disturbance and temporary loss of soil productivity. Significant soil erosion loss on steep slopes; average soil loss about 50 percent above normal.	135 acres of soil disturbance. Potential for soil erosion could be significant due to shallow soils.	1,400 acres of soil disturbance. Significant soil erosion loss on steep slopes.
	Abandonment		
	Similar to construction.	Similar to construction.	Similar to construction.
Aquatic Resources Physical Components	Construction		
	Significant sediment increases in streams below crossings. Decreased base flow in streams from testing.	Temporary sediment increase in streams below four stream crossings not considered significant.	Significant sediment increase in streams below crossings. Decreased base flow in streams from testing.
	Operation		
	Degradation of water quality and reduced salmon and trout populations in some streams from erosion.	Minor sediment increase could reduce salmon and trout populations.	Degradation of water quality and reduced salmon and trout populations in some streams from erosion.

SUMMARY OF IMPACTS (Continued)

RESOURCE	NTPC	NEC	TMC
Biological Components	Construction		
	Significant sediment increase and reduced salmon and trout populations below stream crossings.	Minor sediment increase could reduce salmon and trout populations below stream crossings.	Significant sediment increase and reduced salmon and trout populations below stream crossings.
	Operation		
	Reduced salmon and trout populations below some stream crossings from erosion.	No significant impacts.	Reduced salmon and trout populations below some stream crossings from erosion.
Marine Resources Physical Components	Construction		
	Disturbance to bottom sediments and degradation of marine quality from laying 22 miles of submarine pipeline across Admiralty Inlet and Saratoga Passage.	No significant impacts.	Disturbance of bottom sediments and degradation of marine water quality from laying 5 miles of submarine pipeline across Admiralty Inlet and Saratoga Passage.
Biological Components	Construction		
	Loss of some shellfish in Admiralty Inlet and Saratoga Passage	No significant impacts.	Loss of some shellfish in Admiralty Inlet and Saratoga Passage
Terrestrial Vegetation	Construction		
	Disturbance to 3,900 acres of forestland, 6,600 acres of rangeland, 400 acres of wetland, 300 acres of riparian woodland.	Disturbance to about 135 acres of natural vegetation. Only low grade timber involved. Not considered significant.	Disturbance to 1,585 acres of natural vegetation. Unknown amount of marketable timber removed.
	Operation		
	No regrowth of timber for life of project.	No regrowth of timber for life of project.	No regrowth of timber for life of project.

SUMMARY OF IMPACTS (Continued)

RESOURCE	NTPC	NEC	TMC
Terrestrial Wildlife 	Construction		
	392 acres of wetlands disturbed would reduce waterfowl populations.	Minor habitat losses. No threatened or endangered species involved.	Bald eagle nesting sites disturbed near Point Discovery, Marrowstone, Whidbey and Camano Islands. Peregrine falcon habitat disturbed near Padilla Bay.
Cultural Resources 	Construction		
	Possible destruction of previously unknown fossil deposits and historical and archaeological sites.	Possible destruction of previously unknown fossil deposits and historical and archaeological sites.	Possible destruction of previously unknown fossil deposits and historical and archaeological sites.
	Operation		
	Increased access for vandals and collectors	Increased access for vandals and collectors	Increased access for vandals and collectors
Visual Resources 	Construction		
	Bluff, scars at Port Williams and Port Partridge.	Excavation and blasting on steep slopes could be highly visible from Carcross Highway.	Breaks in natural continuity of skyline would contrast visually, especially in dense, wooded areas.
Land Use 	Construction		
	20,000 acres affected. One season's production lost on about 6,400 acres cropland/pasture, 6,600 acres rangeland. Trees removed on about 3,900 acres forest/woodland.	135 acres affected, about 1/2 forested. 5 miles of route passes thru Klondike Gold Rush National Historic Park.	1,805 acres affected. Lost production for one season on 680 acres agricultural land. 945 acres of forest taken out of production.
	Operation		
	Lost tree production on 2,900 acres forest/woodland.	No tree growth in right-of-way.	No tree growth in right-of-way.

SUMMARY OF IMPACTS (Continued)

RESOURCE	NTPC	NEC	TMC
		Abandonment	
	One season's production lost on 6,400 acres cropland/pasture, 6,600 acres rangeland.	NEC proposes to leave pipe in place.	Lost production for one season on 680 acres agricultural land.
Transportation and Utility Networks 		Construction	
	Traffic congestion and road damage in some areas.	If temporary shutdown of railroad permanent, it would be a significant impact.	Temporary traffic delays on some roads and highways. Significant wear on local roads.
		Operation	
	Electric power requirements would significantly aggravate potential power shortage.	No significant impacts.	Electric power reqirements would significantly aggravate potential power shortage.
		Abandonment	
	Similar to construction	No significant impacts.	Similar to construction
Recreation 		Construction	
	Inconvenience to recreationists.	Suspension of railroad use for one tourist season considered an inconvenience.	Inconvenience to recreationists.
		Abandonment	
	Similar to construction.	Minor impacts.	Similar to construction.
Social 		Construction	
	Temporary strains on housing, public utilities, police and fire protection in many cities and counties.	No significant impacts.	Temporary strains on housing, public utilities, police and fire protection in many cities and counties.
		Abandonment	
	Similar to construction.	No significant impacts.	Similar to construction.

SUMMARY OF IMPACTS (Continued)

RESOURCE	NTPC	NEC	TMC
Economic Conditions			
	Construction		
	Temporary population increase in some communities. Temporary strain on some local government budgets.	No significant impacts.	Temporary population increase in some communities. Temporary strain on some local government budgets.
	Operation		
	Increased tax revenues along route.	Increased tax revenues along route.	Increased tax revenues along route.
	Abandonment		
	Loss of tax revenue.	Loss of tax revenue.	Loss of tax revenue.

Major Impacts Resulting from Catastrophies

The transportation of crude oil entails the risks of major oil spills, fires, and explosions. These risks and their consequences can be predicted with only a limited degree of confidence. Oil spill, fire, and explosion risks and the prediction of major earthquake occurrences for the NTPC proposal are addressed in Chapter 3 of the envirnomental statement; risks involving the NEC and TMC proposals are discussed in Chapter 8.

Crude oil is considered a hazardous material having both toxic and flammable components. Under certain conditions, vapors emitted from crude oil containers such as tankers and storage tanks will explode. Explosions could cause extensive damage to structures as well as loss of life. Explosions could cause major fires which could lead to further losses. Explosions could also cause massive oil spills, both on land and on marine waters.

Large magnitude earthquakes (6.5+ on the Richter Scale) could cause extensive damage to any of the proposed transportation systems, resulting in massive oil spills, fires, and explosions.

Earthquakes

Earthquake caused damage is a remote possibility for all three proposals. An event of magnitude more than 6.5 on the Richter scale could cause severe structural damage. Most damage would result from ground shaking and liquefaction

The port facilities for the NTPC and NEC proposals are situated in seismic risk zone 3 (severe structural damage possible).

Berthing Facilities

The NTPC 2-ship fixed berth, located on Ediz Hook could be subjected to liquefaction resulting in structural damage to the fixed berths and the unloading facility. The two submarine unloading pipelines would be subject to rupture with the possibility of an oil spill in Port Angeles harbor.

The NEC 1-ship fixed berth in Skagway harbor might suffer damage from rockfall from the mountain immediately east of the berth.

The two SPM's proposed by TMC are located in seismic risk zone 2 (moderate structural damage possible). In the event of a large magnitude earthquake, it is possible that the anchors of the SPM's could be jolted loose, causing the SPM's to shift. It is also possible that tne 2 submarine pipelines could rupture resulting in a marine oil spill.

Onshore Storage Facility

The onshore storage facilities of the NTPC and NEC proposals are located in seismic risk zone 3. The onshore storage facility of the TMC proposal is located in zone 2. Ground shaking caused by a large magnitude earthquake could rupture one or more storage tanks, and possibly cause the flow of crude oil into marine waters. Earthquakes of large magnitude could cause major structural damage to the control centers located at all three onshore storage facilities, resulting in the shut down of the systems. Fires might result.

Pipeline Systems

The pipeline system of the NTPC proposal is located in seismic risk zones 3, 2, and 1. The probability of a large magnitude earthquake exists in western Washington and in central Montana. A large magnitude earthquake in western Washington could result in a pipeline rupture possibly causing a major oil spill that could reach the Strait of Juan de Fuca and northern Puget Sound.

The pipeline system of the NEC proposal is located in seismic risk zone 3. A large magnitude earthquake could result in a pipeline rupture, possibly resulting in a major oil spill in Lynn Canal. The pipeline system of the TMC proposal is located in seismic risk zones 2 and 3. A large magnitude earthquake could result in a major oil spill which could reach the Strait of Juan de Fuca and northern Puget Sound.

Major Oil Spills

For purposes of this discussion a major oil spill is greater than 10,000 barrels.

Major oil spills can occur from tankers and barges in transit or at berth. Spills can also occur from storage tanks and from pipelines which transport the oil. The severity of the impact of such spills would depend upon spill volume, its location, meterological, and oceanographic conditions (if a marine spill), and the effectiveness of clean up efforts.

Major Marine Oil Spills

The consequences of major oil spill in marine waters would be:

* Short-term degradation of marine water quality;
* Long-term lowered populations of marine resources including shellfish, fin fish, and marine mammals;
* Long-term lowered populations of waterfowl and their predators;
* Short-term loss of marine-related recreation;
* Short-term loss of marine vegetation;
* Loss of income to fishermen and seafood processors;
* Short-term degradation of visual resources along coast line; and
* Extremely costly oil spill clean up operations by the party responsible for the spill.

Major Terrestrial Oil Spills

The consequences of a major terrestrial oil spill would be:

* Short-term loss of soil productivity, resulting in crop loss;
* Short-term loss of fisheries due to water degradation; and

Figure 6

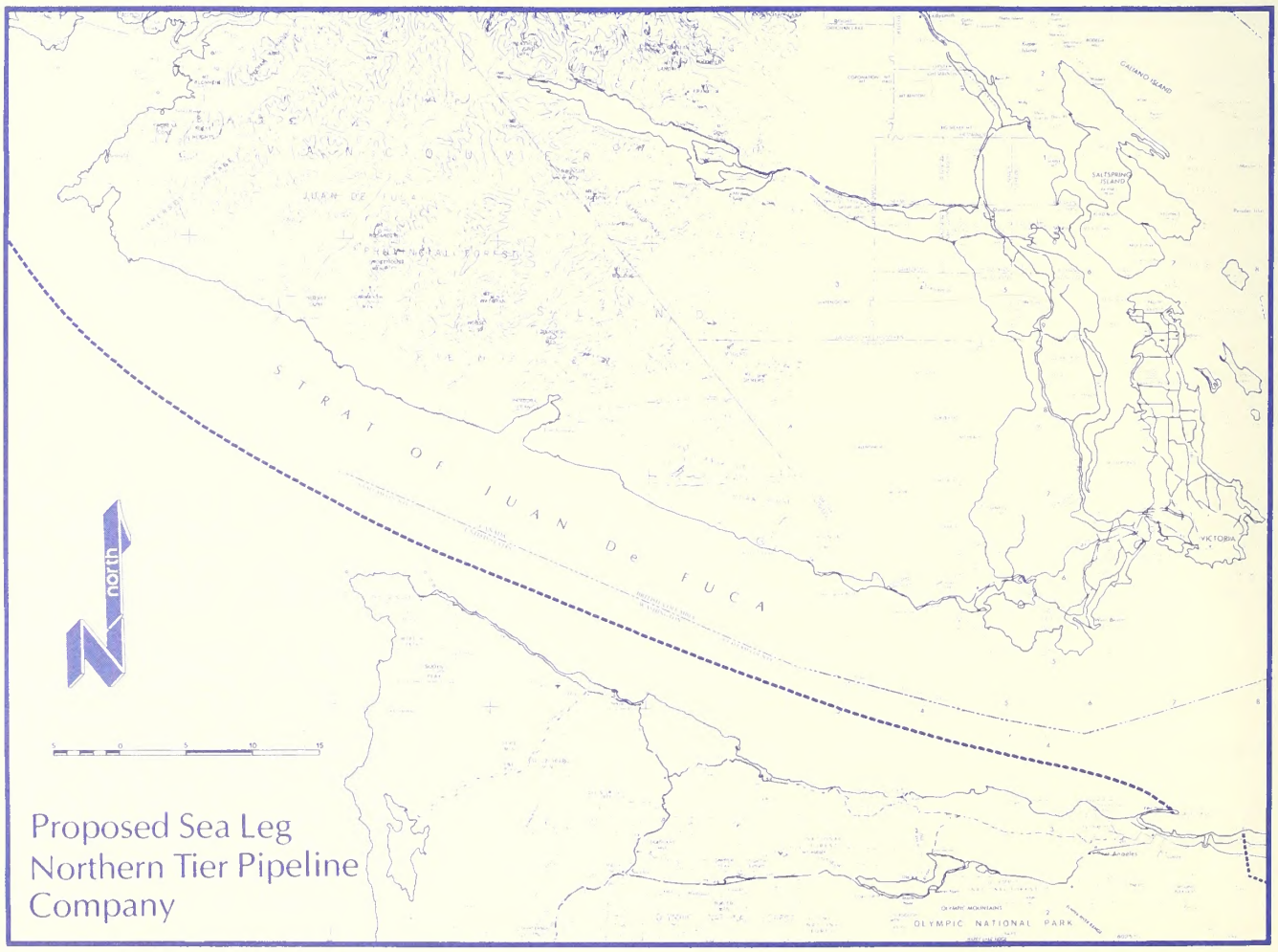

north
STRAIT OF JUAN De FUCA
GALIANO ISLAND
SALTSPRING ISLAND
VICTORIA
OLYMPIC NATIONAL PARK
Proposed Sea Leg
Northern Tier Pipeline
Company

Figure 7

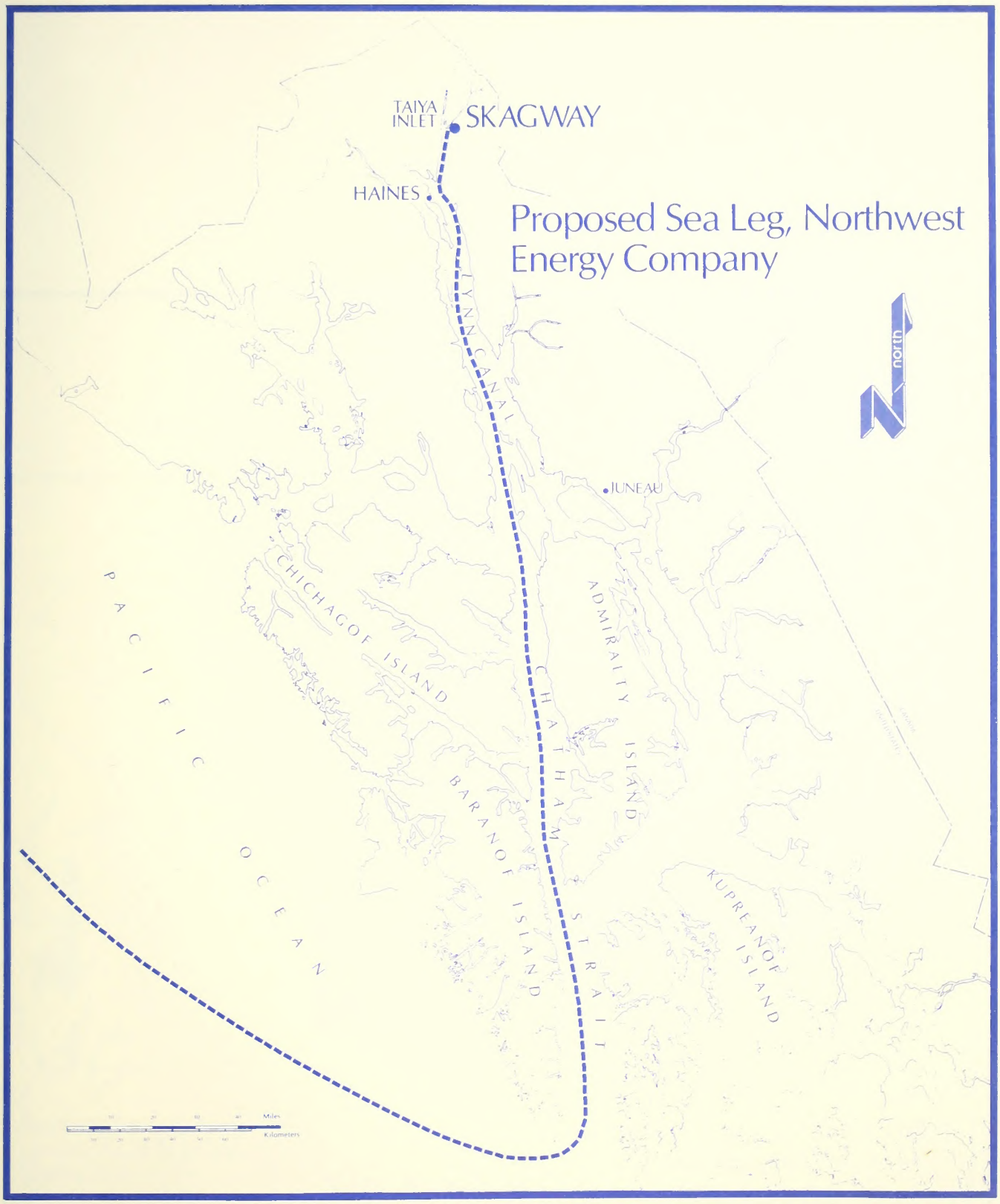
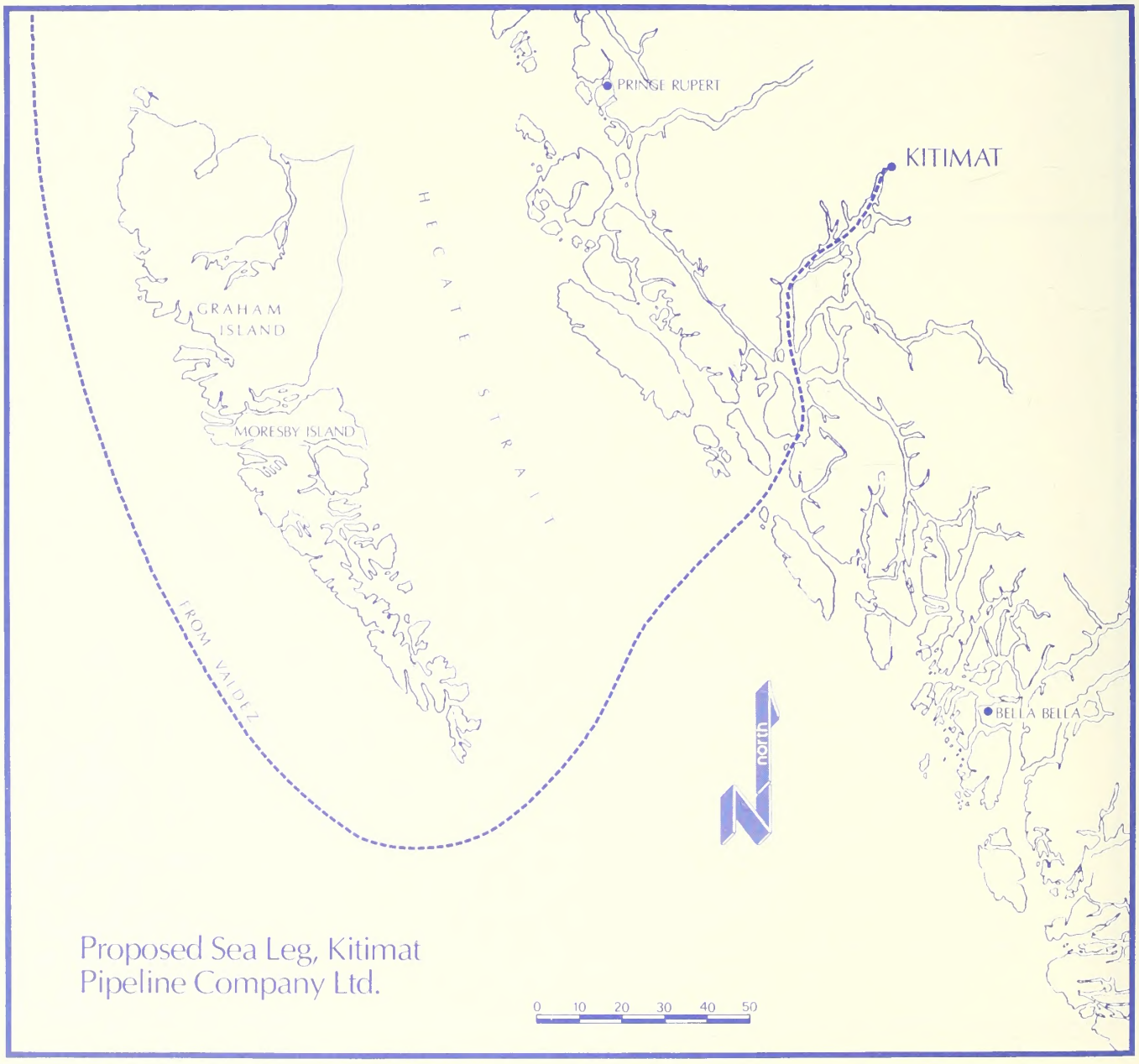
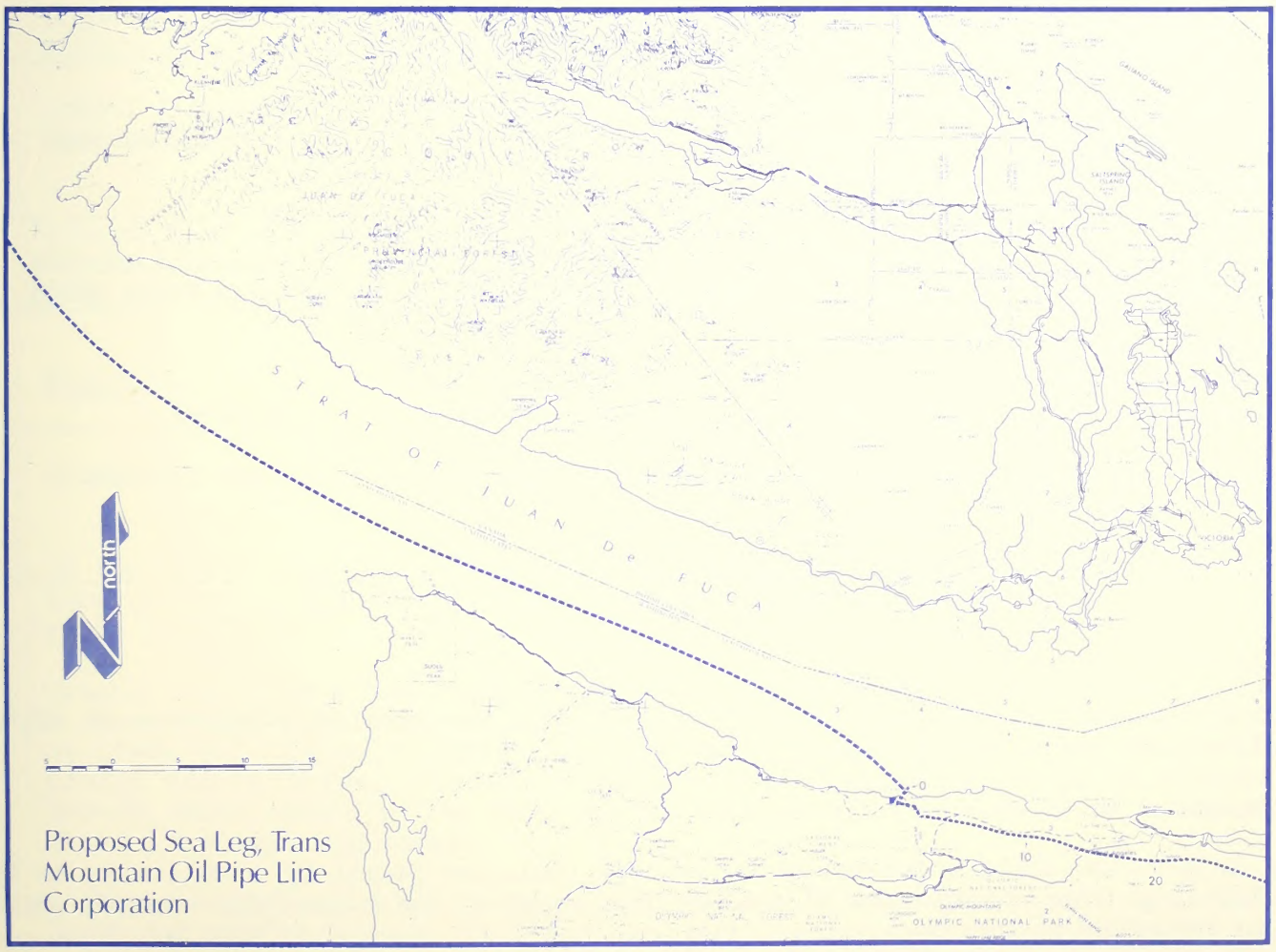

TAIYA INLET
SKAGWAY
HAINES
Proposed Sea Leg, Northwest Energy Company
north
LYNN CANAL
JUNEAU
CHICHAGOF ISLAND
ADMIRALTY ISLAND
PACIFIC OCEAN
CHATHAM STRAIT
BARANOF ISLAND
KUPREANOF ISLAND
Miles
Kilometers

Figure 8



Proposed Sea Leg, Kitimat Pipeline Company Ltd.

Figure 9


north
STRAIT OF JUAN De FUCA
Proposed Sea Leg, Trans Mountain Oil Pipe Line Corporation
OLYMPIC NATIONAL PARK

* Possible long-term degradation of ground water which could degrade municipal water supplies and irrigation waters;

* Short-term degradation of visual resources;

* Costly clean up operations; and

* Possible degradation of the marine environment.

MAJOR OIL SPILL IMPACTS

	NTPC	NEC	TMC
Nautical miles inland waterways (major hazard)	60 (Heavy vessel traffic)	210 (Limited manuevering space, high winds, periods of fog, limited vessel traffic system, deep water precluding anchorage, seasonal heavy fishing)	42 (Heavy vessel traffic)
Inland marine waters affected by submarine pipeline oil spill	Strait of Juan de Fuca, Admiralty Inlet, Saratoga Passage, Skagit Bay	Not applicable	Admiralty Inlet, Saratoga Passage
Marine waters affected by spill	Strait of Juan de Fuca, Puget Sound	Lynn Canal, Chatham Strait	Strait of Juan de Fuca, Puget Sound
Onshore storage facility distance from marine water	Adjacent	3.2 miles	Adjacent
Estimated maximum spill volume before detection (entire system)	4,665 barrels	3,750 barrels	3,265 barrels

Fires

Transportation and storage of crude oil entails the risk of occurrence of major fires. The consequences of major fires are:

Tankers

A major fire while a tanker is in transit could be caused by a collision or by grounding. The consequences of a major fire could be the loss of the tanker's cargo and the possible loss of life.

A major fire while a tanker is at berth unloading or taking on ballast could be caused by electrical sparks or by man's smoking. The consequences of such a major fire would be the possible loss of all or a portion of the ships cargo, with resultant oil spill in the marine environment, damage to the berthing facility, possible loss of life, the possibility of an explosion would also be present.

Of the three proposals, TMC's SPM port facility would probably suffer the least damage from a major tanker fire. NEC's one-ship fixed berth would probably sustain more damage and NTPC's two-ship fixed berth would probably suffer the most damage.

Onshore Storage Facilities

NTPC and TMC: Possible tank rupture, with the resultant loss of crude oil possibly draining into the Strait of Juan de Fuca, possible spreading of the fire to adjoining property, with the risk of a forest fire, possible loss of lives of personnel working in the area, possible explosions with resultant undetermined damages.

NEC: Possible tank rupture, with the resultant loss of crude oil draining into the Skagway river and Lynn canal. The possibility of the fire spreading to adjoining property, possible loss of life. Explosions could occur from a major fire at an onshore storage facility.

Pump Stations

A major fire at a pump station in the United States could result in the loss of life; and the possibility of the fire spreading to adjoining property. There would be one pump station on the NEC proposal, 3 on the TMC proposal, and 21 on the NTPC proposal.

Explosions

Crude oil contains components that are volatile and subject to explosion.

In the analysis of the risk of explosions of tankers in transit and at port, exposure variables used were distance traveled to port and number of port calls. (See table 1.)

Usually the greater the exposure variable, the greater the risk of an explosion. A major tanker explosion could occur while in transit or at berth during offloading of crude oil. A major tanker explosion could result in fires and could possibly damage nearby ships. It can be assumed that a major explosion of a tanker in transit would result in the death of the entire crew and crews of ships within 850 feet of the exploding tanker.

A comparison of estimated damages resulting from a major explosion from a tanker at berth and onshore storage areas and pump stations are shown in the following tables.

COMPARISON OF ESTIMATED DAMAGES RESULTING
FROM A MAJOR EXPLOSION FROM A TANKER AT BERTH

Type of Damage	(Radial distance in feet)	NTPC	NEC	TMC
CASUALTIES:				
Mostly safe.	(1,500)	All persons more than 1,500 feet away	All persons more than 1,500 feet away	All persons more than 1,500 feet away
Lethality threshold.	(1,100)	Workers on log storage area, recreationists, on Ediz Hook, personnel at Coast Guard Air Station entrance, persons in ships and boats	All persons within 1,100 feet	All persons within 1,100 feet
Lethality near 50% probability.	(1,000)	Workers on Ediz Hook, workers on berthing facility, nearby ship personnel	All persons on boats within 1,000 feet, persons on board docked cruise ship	All persons on ships or boats within 1,000 feet
Lethality 100% probability	(949)	Most tanker crew members, most workers on the fuel barge, nearby ship personnel	All persons on boats within 940 feet, tanker crews, dockworkers, fire pump station crew	Tanker crew
STRUCTURAL DAMAGE:				
Wood frame				
Scattered	(6,300)	None identified	None identified	None identified
Moderate	(3,200)	Main building complex at the Coast Guard Air Station	Small boat basin	None identified
Severe	(2,500)	Small boats.	Tugboat wharf	None identified
Brick				
Multi-story		None Identified	None identified	None identified
Light Steel Frame				
Scattered	(6,300)	None identified	Ore concentrate building	None identified
Moderate	(1,200)	None identified	Small boat basin, ferry dock	Possible single point mooring
Severe	(850)	All building complexes at port facility	Fire pump station, tug boat wharf, White Pass and Yukon Route wharf	None identified
Other		None identified	None identified	Unloading line rupture, resulting in oil spills

COMPARISON OF ESTIMATED DAMAGES RESULTING
FROM A MAJOR EXPLOSION AT ONSHORE STORAGE AREAS AND PUMP STATIONS

Type of Damage	(Radial distance in feet)	NTPC	NEC	TMC
CASUALTIES:				
Mostly safe	(1,500)	All persons further than 1,500 feet away.	All persons further than 1,500 feet away.	All persons further than 1,500 feet away
Lethality threshold	(1,100)	A few nearby residences.	All persons within 1,100 feet.	All persons in the storage area within 1,100 feet.
Lethality near 50% probability	(1,000)	Persons in the storage area within 1,000 feet.	All persons within 1,000 feet. This would include all persons within the onshore storage facility and persons traversing the nearby Carcross highway.	All persons in the storage area within 1,000 feet.
Lethality near 100% probability	(940)	Persons in the storage area within 940 feet.	All persons within 940 feet. This would include all persons within the onshore storage facility, persons traversing the Carcross highway.	All persons in the storage area within 940 feet.
STRUCTURAL DAMAGE:				
Wood Frame				
Scattered	(6,300)	Buildings within 6,300 feet.	Buildings within 6,300 feet	Buildings within 6,300 feet. None identified.
Moderate	(3,200)	Buildings within 3,200 feet	Buildings within 3,200 feet.	Buildings within 3,200 feet. None identified.
Severe	(2,500)	Buildings within 2,500 feet	Buildings within 2,500 feet	Buildings within 2,500 feet. None identified.
Brick				
Multi-story		None identified.	None identified.	None.
Light Steel Frame Industrial				
Scattered	(6,300)	Buildings within 6,300 feet.	Buildings within 6,300 feet.	Buildings within 6,300 feet. None identified.

COMPARISON OF ESTIMATED DAMAGES RESULTING
FROM A MAJOR EXPLOSION AT ONSHORE STORAGE AREAS AND PUMP STATIONS

Type of Damage	(Radial distance in feet)	Northern Tier Pipeline Company	Northwest Energy Company	Trans Mountain Oil Pipeline Corporation
Moderate	(1,200)	Buildings within 1,200 feet.	Buildings within 1,200 feet.	Buildings within 1,200 feet including some buildings within the storage site.
Severe	(850)	The control center within the onshore storage facility and all steel buildings within 850 feet.	Buildings within 850 feet including all NEC buildings within the storage facility.	Buildings within 850 feet including most buildings within the storage site.

MITIGATING MEASURES NOT INCLUDED IN THE PROPOSALS

There would be measures which could reduce the incidence, intensity, magnitude and duration of adverse impacts resulting from any of the four proposals. Some impact reducing measures are actually project design features, construction-reclamation methods, or operating procedures.

The proposals address the pipeline routes in terms of 2-mile wide corridors. The port and onshore storage facilities as well as the pipeline system are analyzed in terms of preliminary design features.

Federal, state, and local agencies would require more specific information on proposed locations, design of system components, construction schedules and methods, and operating procedures to determine what mitigating measures would be required. Private landowners also need more site-specific details in order to determine measures they would require as easement provisions.

The possible mitigating measures that follow address only the significant impacts which could result from the proposals. These measures are considered reasonable and enforceable, and could be included as terms and conditions to permits, easements of right-of-way grants issued by private individuals, local, state, or federal agencies should any of the proposals be approved.

Table 3 is a summary of possible mitigating measures common to the port and onshore storage facilities for the NTPC, NEC, and TMC proposals.

Tables 4, 5, and 6 are additional possible mitigating measures specific to NTPC, NEC, and TMC proposals, respectively.

Table 7, is a summary of possible mitigating measures common to the pipeline system for the NTPC, NEC, and TMC proposals.

Tables 8, 9, and 10 are additional possible mitigating measures specific to the NTPC, NEC, and TMC proposals, respectively.

Port Angeles and Harbor

TABLE 3. Possible Mitigating Measures Common to the Port and Onshore Storage Facilities as Proposed by NTPC, NEC, and TMC

Mitigating Measure	Effectiveness	Environmental Component
Prohibit construction activity at night	100 percent effective in keeping nighttime noise levels below standards and preventing annoyance to nearby residents	Noise
Establish minimum separation distances between unloading tankers and other vessels	Nearly 100 percent effective in eliminating risk of collisions, fire, explosion, and oil spills for large commercial vessels. Somewhat less effective for small recreational craft	Marine Resources Recreation
Employ vessel traffic service	Effectiveness in decreasing the risk of tanker accidents and oil spills not determined	Marine Resources
Require tug escort of tankers in inland waterways	Effectiveness in reducing tanker grounding and decreasing risk of oil spill not determined	Marine Resources
Require U.S. Coast Guard approved pilots to accompany tankers in inland waterways	Effectiveness in reducing grounding and collisions and decreasing risk of oil spill not determined	Marine Resources
Require prepayment of property taxes	Nearly 100 percent effective in eliminating local budget deficits	Economic

TABLE 4. Possible Mitigating Measures Specific to NTPC's Proposed Port and Onshore Storage Facility

Mitigating Measure	Effectiveness	Environmental Component
Require tankers to have a segregated ballast capability of at least 20 percent of deadweight tonnage	100 percent effective in eliminating hydrocarbon emissions from ballasting operations	Air Quality
Require a pressure relief setting of at least 1.5 pounds per square inch on all cargo tanks	100 percent effective in eliminating hydrocarbon emissions from venting of emptied cargo tanks	Air Quality
Reroute pipeline to follow gentler slopes and avoid bluff at Green Point	85-90 percent effective in preventing failure and possible pipe rupture	Topography Geology
Designate "no anchorage zone" in vicinity of submarine pipeline	Nearly 100 percent effective in decreasing chance of damage to submarine pipeline from anchor dragging and reducing the risk of pipe rupture and oil spill	Marine Resources
Schedule submarine pipeline dredging to avoid sensitive period during smelt spawning run	50 percent effective in eliminating losses to surf smelt population resulting in an insignificant loss	Marine Resources
Relocate marina and boat ramp prior to construction of port facility	100 percent effective in preventing loss of use of these facilities	Recreation
Restrict port operations during annual salmon derby days	Effectiveness in reducing parking congestion on Ediz Hook and boat traffic congestion in harbor not determined	Recreation
Schedule tanker arrivals to reduce queueing time in Port Angeles harbor	Effectiveness in reducing vessel traffic congestion in Port Angeles harbor not determined	Transportation

TABLE 4. (Continued)

Mitigating Measure	Effectiveness	Environmental Component
Require bussing and carpooling of construction workers to Green Point and Ediz Hook construction sites	Effectiveness in reducing traffic congestion in Port Angeles and Green Point area and possibly Sequim not determined	Transportation
Require relocation of the V.O.R. Air Navigation site prior to construction of the port facility	100 percent effective in preventing temporary loss of an air navigation aid	Transportation
Require U.S. Coast Guard approval of outdoor lighting at the port facility	100 percent effective in eliminating potentially hazardous lighting conditions which could interfere with operations at the U.S. Coast Guard station	Transportation
Require payment of incremental electrical power costs	100 percent effective in preventing increased electrical power costs to other customers which would be caused by the project	Utilities
Implementation of a road management program by local road authorities which would monitor road use and require reimbursement for costs of road repair	Could be significantly effective in collecting the reimburseable costs of road repair	Economics

TABLE 5. Possible Mitigating Measures Specific to NEC's Proposed Port and Onshore Storage Facility

Mitigating Measure	Effectiveness	Environmental Component
Restrict construction around the harbor onshore storage facility site during summer months and limit work during nighttime hours	Reduce annoyance, congestion, and noise during the peak tourist season. Could be 50 to 75 percent effective.	Recreation and Transportation

TABLE 6. Possible Mitigating Measures Specific to TMC's Proposed Port and Onshore Storage Facility

Mitigating Measure	Effectiveness	Environmental Component
Require tankers to use 0.45% sulfur content fuel in port	Reduce about 70% of sulfur dioxide emissions	Air Quality
Locate mainline stations at least 2,500 feet from noise receptors	Eliminate noticable noise increase at receptors	Noise
Designate "no anchorage zone" in vicinity of submarine pipeline	Nearly 100 percent effective in decreasing chance of damage to submarine pipeline from anchor dragging and pipeline rupture and oil spill	Marine Resources
Schedule tanker arrivals to prevent or reduce queueing in port	Reduce vessel traffic congestion and visual impacts to undetermined degree mined degree	Transportation Visual
Establish public relations and coordination program to control labor supply	Reduce influx of unemployed job seekers to undetermined degree	Social Economics
Establish road monitoring and current reimbursement for road damage program	Reduce unreimbursed road damage to undetermined degree	Economics
Require payment of incremental electrical power costs	Up to 100 percent effective in preventing project caused increased power costs being charged to other customers	Economics

TABLE 7. Possible Mitigating Measures Common to the Pipeline Systems Proposed by NTPC, NEC and TMC

Mitigating Measure	Effectiveness	Environmental Component
Use stronger pipe in unstable and potentially unstable areas to absorb stress caused by slope failure and prevent pipe rupture	Effectiveness in preventing slope failure and possible accidents during construction and pipe rupture during operation cannot be determined	Topography Geology
Reroute pipeline to avoid liquefaction zones	100 percent effective in preventing pipe rupture caused by liquefaction	Topography Geology
Use stronger pipe in liquefaction zones	Effectiveness in preventing pipe rupture caused by liquefaction cannot be determined	Topography Geology
Periodic sampling of existing and/or new test wells near pipeline	100 percent effective in providing early warning of oil contaminated water near major aquifers	Aquatic Resources
Avoid threatened and and endangered plant and animal species identified during pre-construction and construction surveys	100 percent effective in providing the opportunity to avoid or reduce damage, destruction, and disturbance to threatened and endangered species by rerouting pipeline or rescheduling construction activities	Vegetation Wildlife
Schedule construction activities to avoid periods of sensitivity which could reduce wildlife populations, particularily bald eagles	100 percent effective in eliminating losses to wildlife populations	Wildlife
Avoid and only when necessary excavate for data recovery cultural and paleontological resources identified during pre-construction and construction surveys	100 percent effective in providing opportunity to avoid destruction of some cultural resources and to recover data from others	Cultural

TABLE 8. Possible Mitigating Measures Specific to NTPC's Proposed Pipeline System

Mitigating Measure	Effectiveness	Environmental Component
Locate mainline stations at least 2,500 feet from the nearest noise sensitive receptors	100 percent effective in preventing a noticeable increase in noise levels at these locations and preventing possible annoyance to residents	Noise
Reroute pipeline to avoid unstable and potentially unstable slopes such as those at Brown Point, Partridge Point, and Siegel Creek	90-95 percent effective in preventing slope failure and accidents during construction and pipe rupture and oil spills during operation	Topography Geology
Water sprinkle disturbed soils in rural areas during construction	50-90 percent effective in eliminating soil losses from fugitive dust. Fugitive dust soil losses 225 lbs/acre without mitigation, 22 to 112 lbs/acre with mitigation	Soils Aquatic Resources
Limit time, rate, and location of test water withdrawal and discharge	Nearly 100 percent effective in eliminating fish mortalities, meeting minimum flow requirements, preventing hydraulic scouring, and insuring quality irrigation water	Aquatic Resources
Place block valves at stream crossings in addition to those specified	100 percent effective in reducing amount of oil entering streams in the event of an oil spill. Percent of reduction different at each stream crossing	Aquatic Resources
Clear flood debris from streams at stream crossings	100 percent effective in reducing accelerated scour and potential pipe rupture	Aquatic Resources
Divert flow around construction area in streams	Effectiveness in reducing sediment concentration and siltation in streams not determined but expected to be significant	Aquatic Resources
Require barge or onshore storage of streambed spoils	Effectiveness in reducing sediment concentration and siltation not determined but expected to be significant	Aquatic Resources

TABLE 8. (Continued)

Mitigating Measure	Effectiveness	Environmental Component
Reroute submarine pipeline around valuable clam and oyster beds	100 percent effective in eliminating loss of clam and oyster beds	Marine Resources
Revegetate corridor with plant species beneficial to wildlife, particularly in areas where valuable summer or winter food species would be removed	100 percent effective in assuring against loss of valuable food species for wildlife	Wildlife
Locate borrow areas away from roads and public use areas	Nearly 100 percent effective in eliminating public exposure	Visual Resources
Establish vegetative screen where right-of-way crosses trails and scenic travelways	Nearly 100 percent effective in eliminating visual intrusion of right-of-way depending on vegetation used and terrain	Visual Resources Recreation
Reroute pipeline to avoid the Oakville Prairie in North Dakota	100 percent effective in eliminating impacts to scientific study area	Land Use
Reroute pipeline to avoid subsurface drain tile in agricultural areas or modify existing drainage systems encountered to insure proper drainage	100 percent effective in preventing drainage problems on agricultural lands	Land Use

TABLE 8. (Continued)

Mitigating Measure	Effectiveness	Environmental Component
Require use of aerial, cable, or other special equipment and methods to transport material and equipment in areas where extensive road construction would be undesirable	Effectiveness in eliminating extensive road construction or modification not determined. Effectiveness of reducing soil erosion varies with topography, vegetation, and soil type	Transportation Land Use Soils
Require appropropriate agency approval for location and design of access roads	Effectiveness in reducing damage to existing roads and assuring compliance with applicable policies not determined	Transportation
Designate special camping areas for construction crews	Effectiveness of reducing demands on camping facilities and housing not determined	Recreation Social
Erect physical barrier to vehicles on pipeline access roads and on national trails	Effectiveness in preventing recreational vehicles from entering right-of-way and disturbing other recreationists and contributing to soil erosion not determined	Recreation Soils
Require payment of incremental electrical power costs	100 percent effective in preventing increased electrical power costs to other customers which would be caused by the project	Utilities
Require that construction activity in the Williston, North Dakota area not be conducted concurrently with construction of the Northern Border Gas Pipeline	100 percent effective in reducing demands on housing and community services to an acceptable level	Social
Provide field medical personnel during construction	Effectiveness to reducing demands on local medical personnel not determined	Social

TABLE 8. (Continued)

Mitigating Measure	Effectiveness	Environmental Component
Construct temporary camps for construction workers	Effectiveness in reducing demands on local housing not determined	Social Economic
Implementation of a road management program by local road authorities which would monitor road use and require reimbursement for cost of road repair	Could be significantly effective in collecting the reimburseable costs of road repair	Economics

TABLE 9. Possible Mitigating Measures Specific to NEC's Proposed Pipeline System

Mitigating Measures	Effectiveness	Environmental Compontent
Provide temporary housing (including sewage and water) in Skagway for 400-500 personnel employed during construction phase who will not be housed in the construction camp	Reduce demand on permanent housing in Skagway; reduce amount of permanent housing left vacant after construction; reduce impact on local hotels. This measure would be 80 to 90 percent effective	Social Economic Recreation
Locate pipeline away from historic and tourist sites	Preserve integrity of railroad bed, stations, and viewpoints; protect pioneer cemetery, White Pass City, Brackett Road, White Pass Trail, Liarsville camp and Heney camp. This measure should be 95 to 100 percent effective	Cultural Resources Recreation
Remove waste rock from park unit for removal	Reduce damage to vegetation and visual resources of the park by about 20 to 35 percent	Visual Resources Vegetation Cultural Resources Recreation
Avoid use of herbicides for corridor maintenance	Prevent impacts of herbicides on vegetation adjacent to corridor; prevent introduction of herbicides into food chain. This measure would be 100 percent effective	Terrestrial Wildlife Vegetation Visual Resources Recreation

TABLE 10. Possible Mitigating Measures Specific to TMC's Proposed Pipeline System

Mitigating Measure	Effectiveness	Environmental Component
Locate mainline stations at least 2,500 feet from noise sensitive receptors	Prevent noticeable increase in noise levels and annoyance at these locations	Noise
Reroute pipe to avoid unstable coastal bluffs	Nearly 100 percent effective in preventing pipeline rupture in such areas	Topography Geology
Water sprinkle disturbed soils during construction	50-90 percent effective in eliminating soil loss	Soils
Limit construction construction across streams at specific time periods	Nearly 100 percent effective in preventing mortalities to some fish species; protect irrigation uses	Aquatic Resources
Limit time, rate, and location of test water withdrawal and discharge	Nearly 100 percent effective in preventing mortality, meeting minimum flow requirements, preventing scouring, and insuring quality irrigation water	Aquatic Resources
Place block and/or check valves at stream crossings in addition to those specified	Up to 100 percent effective in reducing oil reaching stream in event of a spill	Aquatic Resources
Clear flood debris from streams at crossings	Up to 100 percent effective in reducing accelerated scour and possible pipe breaks	Aquatic Resources
Divert flow around construction area in large streams and/or use barge or shore storage of spoil	Reduce stream siltation to undetermined but significant amount	Aquatic Resources
Periodic sampling of existing and/or new new test wells near pipeline	Up to 100 percent effective in giving early warning of oil pollution of water near major aquifers	Aquatic Resources

TABLE 10. (Continued)

Mitigating Measure	Effectiveness	Environmental Component
Locate precisely and route submarine pipelines around valuable clam and oyster beds	Up to 100 percent effective in protecting shellfish resources	Marine Resources
Establish vegetative screen where right-of-way crosses trails and scenic travel	Undetermined effectiveness reducing visual intrusion of right-of-way	Visual Resources Recreation
Designate special camping areas for construction crews	Reduce demands on existing camping facilities and housing to undetermined extent	Recreation Social
Route pipeline to avoid drain tile in agricultural areas or modify existing drainage systems to ensure proper drainage	100 percent effective in preventing drainage problems on agricultural lands	Land Use
Establish construction work hours to avoid established traffic congestion hours on access roads	Effective to undetermined degree in reducing traffic congestion in both urban and rural areas	Land Use Transportation
Provide field medical personnel during construction	Undetermined reduction on demands on local medical facilities	Social
Require appropriate agency approval for location and design of access roads	Reduce damage to existing roads and insure compliance with plans and ordinances to undetermined degree	Transportation Land Use
Locate borrow areas away from roads and public use areas	Up to 100 percent effective in reducing public exposure of such areas	Visual

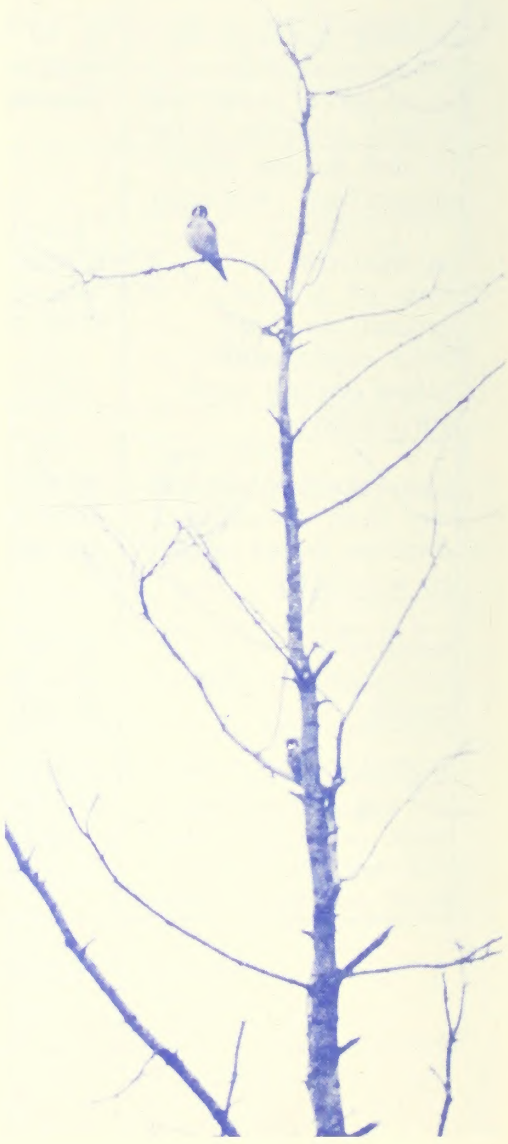
TABLE 10. (Continued)

Mitigating Measure	Effectiveness	Environmental Component
Maintain adequate clearances between energized conductors and men and equipment	Undetermined but significant effectiveness in reducing electrocution hazard to workers	Utilities Social Conditions
Conduct surveys for cultural resources prior to and during construction	Up to 100 percent effective in providing opportunity to avoid destruction of or recover data from cultural resources	Cultural
Conduct surveys for threatened and endangered plant and animal species prior to and during construction	Up to 100 percent effective in providing opportunity to avoid or reduce damage to threatened and endangered species	Vegetation Wildlife
Maintain a buffer zone of 1 mile around northern bald eagle nest sites during construction	Effective to undetermined significant degree in preventing nest abandonment and loss of northern bald eagle production	Wildlife
Revegetate right-of-way with specific species beneficial to wildlife	Up to 100 percent effective in preventing loss of wildlife food species in disturbed area	Wildlife
Require payment of incremental power costs	Up to 100 percent effective in preventing increased power costs caused by the project to other customers	Utilities Economics
Implement road monitoring and management program with current reimbursement for road damage	Significantly effective in collecting reimburseable costs of road repair by local agencies	Economics

ANY ADVERSE IMPACTS THAT CANNOT BE AVOIDED SHOULD THE PROPOSAL BE IMPLEMENTED

These impacts would occur as a result of the construction, operation, and abandonment of the proposals. As discussed under mitigation there would be adverse impacts which could be either totally or partially mitigated. There would also be impacts for which there would be no possible mitigative measures.

Tables 11 and 12 are a summary of those unavoidable adverse impacts which are unmitigatable or only partially mitigatable.



Log storage area — Ediz Hook

TABLE 11. Summary of Major Adverse Impacts which cannot be Avoided if the Proposals are Implemented Port and Onshore Storage Facilities

RESOURCE	NTPC	NEC	TMC
Air Quality	3-hour and 24-hour class I incremental standard for sulfur dioxide would be exceeded	None	Occasional violations of the 24 hour class II incremental standard for SO_2. South of Low Point + of Class I at Lake Cresent
Noise	Noise from pile driving activities could cause annoyance to persons in harbor and on Ediz Hook	Annoyance to tourists on tour boats cruise ships and residents of Skagway	None
Topography/Geology	None	Change in landform could cause slope failure	None
Marine Resources	Decrease in marine water quality during construction. Chronic oil spills would degrade water quality	Chronic oil spills would degrade water quality	Chronic oil spills would degrade water quality
Terrestrial Wildlife	Bald eagles would move from the immediate area	None	None
Cultural	Unrecorded cultural resources could be destroyed	Unrecorded cultural resources could be destroyed	Unrecorded cultural resources could be destroyed
Visual	Scar on coastal cliff	None	Scar on coastal bluff
Land Use	Displacement of log storage area, pilot station, marina, boat ramp and air navigation station	None	Remove storage from woodland & pasture production
Transportation & Utility	Potential electrical power shortage	None	Potential electrical power shortage

TABLE 11. (Continued)

RESOURCE	NTPC	NEC	TMC
Recreation	Marine traffic congestion and hazards to angling and boating	Marine traffic congestion and hazards to angling and boating	Reduce use of Lyre River campgrounds. Reduction of available angling area
Economic/Social	Reduction in harvest of some shellfish and increased prices for goods and services during construction phase	Housing shortage and and loss of jobs if the railroad is closed for commercial use. Increased prices for goods and services	Possible inteference with Indian Fisheries. Increased prices for goods and services

Bureau of Land Management

TABLE 12. Summary of Major Adverse Impacts which cannot be Avoided if the Proposals are Implemented Pipeline System

RESOURCE	NTPC	NEC	TMC
Topography/Geology	Changes in landform could cause slope failure	Changes in landform could cause slope failure, rockslides	Changes in landform could cause slope failure
Aquatic Resources	Sedimentation of streams and rivers during construction	Sedimentation of salmon and trout spawning areas could cause short term population reduction	Sedimentation of salmon and trout streams. Potential ground water contamination
Marine Resources	Decrease in marine water quality during construction	None	Degradation of marine water quality during construction of Admiralty Inlet and Saratoga Passage crossings
Terrestrial Wildlife	None	None	Disturbance of bald eagles in Marrowstone Island area during construction and possibly of peregrine falcon in Burlington area
Cultural	Unrecorded cultural resources could be destroyed	Unrecorded cultural resources could be destroyed	Unrecorded cultural resources could be destroyed
Visual	Scars on sea cliffs and at some major river crossings	Visual intrusion on a scenic area of Klondike Gold Rush National Park	Scars on sea bluffs at Saratoga Passage & Admiralty Inlet crossings
Transportation & Utility	Potential electrical power shortages	Commercial use of the railroad and CANOL pipeline would be eliminated for one year	Potential electrical power shortage
Recreation	Any loss of shellfish beds would cause a corresponding reduction in the outings by shellfish collectors	None	Recreational use of some areas would be reduced during construction

TABLE 12. (Continued)

RESOURCE	NTPC	NEC	TMC
Economic/Social	Reduction in harvest of some shellfish for a few years	Housing shortage and loss of jobs if the railroad is closed for commercial use	Housing shortage during construction. Temporary reduction in quality of life in Island County during construction

THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

For summation purposes, the relationship between the short-term use of man's environment and the maintenance and enhancement of long-term productivity is essentially the same for the NTPC, NEC, and TMC proposals. Consequently unless otherwise indicated the following discussion includes all three proposals. Short-term is considered to be any period of time during the estimated 20-year economic lives of the proposals. Long-term is considered to be the period of time starting with project implementation through project life and an indefinite period beyond.

The major purpose of each proposal is to provide a common-carrier crude oil transportation system capable of supplying crude oil to northern tier and inland states. Short-term benefits would accrue to crude oil producers, refiners, the project sponsor, local taxing bodies, and to consumers of the refined products. The major short-term trade-offs resulting from the projects would be loss of existing environmental values in the port areas caused by the construction and use of harbor facilities or open water area. There would be a short-term commitment of land for the onshore storage facilities and pipeline system corridors with the likelihood that similar uses would continue in the long-term. There would be a short-term risk of environmental damage from oil spills, fires, and explosions. There would be short-term risk to human health and safety. Intermittent periods of air quality degradation also would be experienced in the port areas.

PORT AND ONSHORE STORAGE FACILITIES

Port Facilities

The short-term use of the harbors would cause short-term changes of their use. The long-term productivity of marine resources in the harbor and adjacent areas should not be affected by short-term losses incurred during project construction and operation. Long-term productivity of marine resources could be decreased if a major oil spill occurred.

The commitment of present harbor uses to project uses could preclude the development of additional areas to handle commodities other than crude oil during the short-term. This could result in long-term changes as well. Except for the TMC proposal, the tanker unloading facilities might continue to operate beyond the short-term, thus precluding other deep water uses of the harbor.

Short and long-term attraction of petroleum-related industries in the port areas would not likely occur. In order not to exceed the Prevention of Significant Deterioration incremental air quality standards, other industries could be precluded from expanding or locating in the area.

The proposals are perceived by many as a trade-off of highly valued existing quality of life features for an incompatible industrial installation with limited benefits for the local area. The short-term commitment of the area's resources to project purposes could make it difficult to maintain and enhance, for the short and long-term, the amenities and resources which support the local population. The projects are also perceived by some as having short-term and potential long-term risks to health, safety, and the general quality of life which would not be offset by short-term economic benefits. The trade-off can be seen as a short-term commitment to an

industrial installation with a sacrifice of a way of life based on local natural resources.

There would be local degradation of air quality and increased noise during construction. During operation, the Class I, Prevention of Significant Deterioration standards for sulfur dioxide would be exceeded by the NIPC and TMC proposals.

Large oil spills from tankers, submarine pipelines, or unloading facilities would result in short-term environmental damage beyond that related to normal project operation. Reduced productivity of marine resources during the short-term could continue during the long-term. Minor operational spills would be relatively frequent resulting in localized reduction of marine water quality for short periods. The cumulative effect of such spills would likely result in some displacement of marine plants and animals and in long-term reduction of productivity in local areas.

A major oil spill would not likely occur during the 20 year life of any of the projects. However, should one occur, it would affect marine resources, water quality, shorelines, shoreline structures, boats and waterfowl over a wide area. A major spill could kill waterfowl, disrupt salmon migration, damage clam and crab habitat for several years, and possibly affect endangered marine mammals. The short-term loss in productivity would be significant. Some loss of marine resource productivity could continue during the long-term.

Onshore Storage Facilities

The short-term use of the onshore storage facilities would entail long-term commitments of environmental resources. The land could conceivably be used for other commercial or industrial or perhaps residential use when the project is abandoned. The topography and soils would be permanently altered which would limit future use. Ground water quality could be degraded into the long-term should a major oil spill occur at the storage facilities.

During construction of the onshore storage facilities, air quality would be reduced locally and noise could be an annoyance to some residents. It is not expected that federal or state air quality standards would be exceeded. During the short-term operation phase there would be continuous hydrocarbon emissions from the storage tanks. These should not exceed standards for hydrocarbon or ozone.

The onshore storage facilities would cause a deterioration of visual quality for the life of the proposals.

PIPELINE SYSTEMS

Land would be disturbed by construction of the pipeline system and related facilities. Most areas within the pipeline corridor could be returned to pre-construction uses within several years; however, buildings and trees would be prohibited on the rights-of-way during the short-term.

Use of land resources for the pipeline right-of-way would not significantly affect either short or long-term productivity. In mountainous, forested areas the opening of a corridor could significantly alter land use. However, the pipeline routes would generally follow existing transportation and utility corridors. The proposed

pipelines would require additional clearing along existing corridors and new clearing in some segments. Once established, a utility corridor tends to attract additional new utilities. Therefore, an initial commitment is likely to result in long-term utility corridor use.

Along most of the proposed pipeline routes there would be negligible effects on topography. However, in steep terrain the excavation of a right-of-way of workable width would constitute a long-term alteration of the topography causing a long-term reduction of visual quality.

Construction of the pipeline systems would adversely affect air quality, noise levels, soil productivity, vegetation, wildlife, water quality, fish in freshwater streams, and recreational activities during the short-term. None of these short-term uses are likely to significantly reduce long-term maintenance or productivity of these resources.

In most cases, cultural resources along the pipeline corridors would be excavated by professional archaeologists prior to construction. This use of cultural resources would be a trade-off in which some short-term value would be obtained in exchange for the loss of potentially greater long-term value. In some cases, cultural resources would probably be destroyed by construction equipment resulting in long-term losses.

Except for the NEC proposal, electric power required by pump stations might exceed firm power supplies available to local utility companies. In potential problem areas, short-term requirements for power could affect the abiliity of local utilities to provide firm power. Public utilities might curtail power to other customers. Following project abandonment, there would be additonal power available for other customers.

Construction of a pipeline would require a variety of social and community services in towns along the route during the construction period. None of these human resource uses during the short-term would require significant trade-offs or constrain long-term opportunities.

Wages and property taxes derived from pipeline construction and operation would provide economic benefits to communities and to counties crossed by the pipelines. This could result in significant short-term beneficial impacts. Abandonment of the projects would eliminate these benefits for the long-term.

Minor pipeline leaks could occur frequently throughout the short-term. Such spills would require the use of some resources in the local area for a short time. Spills could have long-term adverse effects. There could be unknown long-term effects of oil spills on soil productivity. Oil spills on land surfaces could result in degradation of ground water quality into the long-term.

Oil entering streams would result in temporary degradation of water quality and destruction of some fish and other freshwater organisms and their habitats. Effects would be carried downstream for some distance depending on spill size and stream characteristics. In some areas, a spill could damage marine resources or freshwater resources, however, the damage from minor spills would probably be ameliorated within a few years. Short-term reduction in fish productivity could result from oil contaminating significant spawning areas. Oil spills would not likely alter the long-term productivity of fishery resources.

Oil spills in waterfowl nesting or concentration areas could cause short-term and possibly long-term loss of waterfowl productivity. The degree of impact would depend upon season of occurrence and success of habitat reclamation. Construction and operation of a pipeline across wetlands used by waterfowl would involve a possible long-term reduction of waterfowl productivity.

A major pipeline oil spill is unlikely to occur during the short-term. Should one occur, the significance of environmental damage would depend on the time, location, size of spill, success of clean up efforts, and speed of reclamation. The potential for long-term reduction of resource productivity would be greater for major spills than minor leaks.

In summary, the proposed projects would cause both short-term and long-term adverse and beneficial changes to various components of the environment. The projects would have significant effects on the preservation, maintenance, and enhancement of existing environmental values in port areas. The trade-off would provide short-term economic benefits in exchange for a change of life style with some risks to present and future recreation, commerce, health, and safety. Along the pipeline systems, some resources would be used during construction. These resources, plus those committed for short-term, would not involve any significant alterations in long-term productivity. The major trade-off involves the risk of oil spills, fires, and explosions, with possible resultant damage to man and his environment, in exchange for short-term economic benefits of supplying oil to refineries in northern tier and other inland states.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

For summation purposes, the irreversible and irretrievable commitment of resources is essentially the same for the NTPC, NEC and TMC proposals, but would vary in incidence, intensity, duration, magnitude, and location. The following discussion summarizes those resources that would be consumed or otherwise lost if a proposal was implemented. The use of finite resources in a manner which precludes their use for other purposes is termed an irreversible and irretrievable commitment of resources. An irreversible commitment would be incapable of being reversed; once initiated, use would continue. An irretrievable commitment is essentially irrecoverable; once used, not replaceable.

Air Quality

Air quality and visibility would be irretrievably degraded during the life of the projects, particularly in port areas. The NTPC proposal would cause sulfur dioxide levels to exceed allowable limits 10 or 14 days each year. This condition would be short-term but not irreversible. Periods of air quality degradation would be irretrievable.

No irreversible or irretrievable commitments of air quality along the pipeline routes is anticipated.

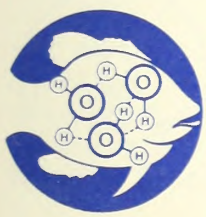
Soils

Construction of the onshore storage facilities would irretrievably commit land for the life of the projects. Soils lost by wind and water erosion during construction would be irretrivably lost. Construction, operation, and maintenance of a new

pipeline, powerline maintenance roads, support facilities, runoff holding basins, and tank storage sites would cause a loss of soil productivity for the life of the projects and for an undetermined length of time after abandonment.

Mixing of the soil profile would retard natural revegetation within pipeline rights-of-way. A slight, temporary reduction of soil productivity could be anticipated where new pipeline construction would cross agricultural areas, despite double-trenching techniques. Soil profiles within the trench and the areas of excavation would be permanently altered. Soils lost to erosion during construction, operation, or abandonment would be irretrievably lost.

An oil spill could cause significant and irretrievable loss of soil productivity for several years. With time and careful rehabilitative efforts, soil productivity might be reestablished.



Aquatic Resources

Construction of the onshore storage facilities could result in an irretrievable loss of water quality. Alteration of localized shallow aquifers would be an irreversible commitment of ground water resources.

Construction of a pipeline and related facilities would degrade water quality in numerous streams. Degradation would be largely short-term however, short-term loss of water quality would be irretrievable. Degradation of groundwater resources could last for several years. Associated with loss of water quality would be the possible loss of fish spawning habitat which could be irreversible and extend beyond the life of the project. Reduced fish populations would be irretrievable.

An oil spill affecting aquatic resources would lead to an irretrievable commitment of resources. In most cases the loss would be short-term. However, a longer irretrievable loss of water quality could occur if an oil spill contaminated ground waters. Degradation of water resources resulting in a loss of municipal, industrial, irrigation, or domestic uses could be critical.

At critical times and locations, an oil spill could result in irretrievable losses to resident and anadromous fish populations.

Marine Resources

Construction of ports and submarine pipelines would result in degradation of marine water quality. This loss would be of short duration, but would be irretrievable. After abandonment, if the submarine pipes were salvaged, a similar degradation could be expected.

Construction would also cause irretrievable loss of marine organisms within the harbors. However, while the project was in operation, new populations of these organisms would be expected to repopulate disturbed areas.

It would be expected that small chronic spills of crude oil from tankers and associated vessels would occur. Such spills would result in an irretrievable reduction of water quality in the harbor. Chronic small volume spills would also lead to an irretrievable loss of marine life in the immediate area of the berthing facilities.

A catastrophic accident involving crude oil tankers, fuel barges, or a break in the submarine pipelines would cause significant degradation of marine water quality. Restoration of water quality to pre-spill levels could be slow with a resulting irretrievable long-term loss of water quality. A catastrophic spill would also cause the irretrievable loss of marine life. However, that loss would be replaced in kind over the long term.

Terrestrial Vegetation

Construction of onshore storage facilities would result in the irretrievable loss of vegetation. This loss would be irreversible if the area were to be converted to other industrial or commercial uses following abandonment.

Construction of a pipeline would result in the irretrievable loss of forest resources for the duration of the project within the maintained right-of-way. In addition, irreversible losses of wetland vegetation in NTPC's proposal would occur.

An oil spill would result in the irretrievable loss of vegetation and the irretrievable loss of soil productivity. Complete vegetative reestablishment could occur along with soil recovery.

Terrestrial Wildlife

Construction of onshore storage facilities would result in the irretrievable loss of habitat for some wildlife.

Construction of pipeline would result in the irretrievable change of wildlife habitat throughout its length, for the duration of the projects. Following abandonment and subsequent revegetation, wildlife habitat productivity could be expected to return to near preproject levels.

Oil spills and resulting clean up efforts would be expected to result in the loss of individual animals because of oiling or toxicity and the loss of habitat. Small chronic spills would be expected to cause irretrievable loss of individual birds as they come in contact with the oil. Raptors ingesting dead, oil-contaminated animals and fish would also die.

Cultural Resources

Each cultural resource site has unique and nonrenewable values. Known cultural resources affected by a project can often be salvaged before construction. However, even if salvaged, the loss of resource sites from the in-place resource base would constitute an irretrievable loss. Once construction is underway, cultural resources not previously identified could be partially or totally destroyed before the resource is recognized and construction stopped. Unrecovered materials would be an irreversible and irretrievable commitment.

Loss of paleontological resources would be similar to loss of archaeological and historic resources. Since many marine invertebrate fossils are abundant and widely distributed, the loss of some of them would not be particularly significant. In contrast however, many fossils are rare and are found only in local areas. Such

fossils and their surrounding sediments may contain unique and valuable information about past environments and biological adaptions. The irretrievable loss of such resources could be significant.

It is expected that damage to cultural resources would be minimal due to the relative scarcity of resource sites. If an oil spill were to occur in the vicinity of a site, it is probable that clean up efforts would pose a greater threat to their loss. Use of machinery or hand tools could cause the irretrievable loss of cultural resources.

Visual Resources

Construction would irreversibly alter visual resources at port and onshore storage facility sites.

Construction of a pipeline and related facilities would result in irretrievable degradation of visual resources across the entire routes of the pipelines. Visual contrast would be the greatest and irreversible through forested lands and at delivery facility sites.

A marine oil spill could result in irretrievable but short term degradation of visual resources in port areas. The extent of visual degradation could be extensive extending along several miles of shoreline.

Land Use, Transportation, and Utility Networks

Construction of a port facility would preclude other uses in the harbor area.

Construction of an onshore storage facility would preclude other potential uses, such as industrial, commercial or residential development. These losses would probably be irreversible because other industrial or intensive use would be expected to follow abandonment.

The pipeline right-of-way, pump station sites, and powerline rights-of-way represent irreversible land-use commitments for the life of the projects. In some areas, these installations would restrict expansion of transportation or utility corridors. Considering the difficulty of routing new utilities, it is likely that the pipeline corridors would be converted to other utility or transportation corridor use

following abandonment. Thus, the establishment of the corridors would likely be irreversible.

Major impacts from oil spills on land uses and transportation and utility networks would cause irretrievable short-term disruptions.

Recreation

Construction of a pipeline would cause irretrievable losses in certain areas of recreational resources. The cleared right-of-way and access roads would irreversibly change areas valued for beauty, solitude, or other natural qualities. Displacement of wildlife or loss of fishery resources would also irretrievably affect recreation activities. Maintained corridors could increase hunter pressure and irretrievably commit previously remote areas to more dispersed recreation use.

Oil spills and resulting clean up efforts would result in the irretrievable loss of recreational opportunities for sport fishing, scuba diving, boating and other water related activities.

Social and Economic Conditions

Construction and operation of port and onshore storage facilities would result in major irretrievable and irreversible changes. An oil port would be a major contributor to the local economy not reliant on locally produced natural resources. To many local residents, project construction would irretrievably decrease the quality of life.

During construction, operation, or abandonment, loss of life or limb from accidents would be irretrievable and irreversible.

Major quantities of steel used in constructing port and onshore storage facilities would be irreversibly committed. A portion of this steel could be salvaged upon termination of the project. Non-salvageable steel and other natural resources would be irretrievably lost, including sand, gravel, and cement used in making concrete; an undetermined volume of select fill; copper; and lumber.

Along the NTPC pipeline route, construction, operation, and abandonment would result in irretrievable changes in many small communities. For the most part these changes would be short-term during the construction stage.

Construction of pipelines would commit hundreds of thousands of tons of steel including the pipe, storage tanks, and support equipment. The steel in some of these items would be reclaimable upon the termination of the project. In addition, natural resources committed to the construction and conversion of the project would be irretrievably lost, including sand, gravel, and cement used in concrete; copper; lumber; and unknown quantities of water and fuel.

Implementation of a project would irretrievably commit thousands of workers for various periods of time during the construction phase. Construction would require the equivalent of thousands of man-years of labor in direct employment. Indirectly the project would irretrievably commit the equivalent of thousands of jobs in the steel industry for manufacturing steel for the pipe and storage tanks. Once construction was finished, permanent employment of hundreds of persons would be irretrievably committed to operate the systems for the 20-year project life.

Additional unknown numbers of workers could be committed to assess, mitigate, or compensate for project impacts.

The commitment of power to transport the oil would be substantial and would be irretrievable.

A major oil spill would result in the irretrievable commitment of human and material resources for clean up efforts. A spill could cause an irretrievable decrease in the quality of life in the port city because of the importance of the marine environment to the local community. A degradation of the human environment through contamination and loss of life or limb from fire or explosion would be irretrievable and irreversible losses.

ALTERNATIVES TO TITLE V PROPOSALS

The previous sections considered the environmental effects of constructing and operating proposed crude oil transportation systems. This section considers the environmental effects of not selecting a proposed system, of delaying selection of a system, and of accomplishing the purposes of the proposed action by other alternatives.

The port, storage facility, and route segment alternatives described in this section represent a selection of variation of the four proposed pipelines systems. These alternatives have resulted from considering legal requirements, public preferences, and avoidance of major environmental problems, Indian Reservations, and special federal and state lands.

While the specific environmental impacts of constructing, operating or abandoning a crude oil transportation system depends upon the environmental setting in which it is placed, many of the impacts of such a system are constant and are all common to each system.

Rather than repeat those common elements, this alternative section sets forth those impacts unique to that specific alternative or would highlight those impacts of that alternative considered to be the most important.

Oil spill trajectories discussed in the port alternatives were based upon spring and fall tidal patterns using worse case wind conditions.

No Action

The no action alternative assumes that the decision would be made not to select any of the four proposed crude oil transportation systems, thereby precluding the implementation of the projects as proposed by the four applicants under Title V of the Public Utility Regulatory Policy Act of 1978.

If none of the pipelines are constructed and a crude oil shortage develops in the northern tier states, northern tier refineries would need to find alternative ways of obtaining crude oil, cut back, or stop production. Without one of the proposals the excess to west coast refinery needs would continue unless production at Prudhoe Bay were curtailed to equal west coast demand.

Delayed Action

The delayed action alternative assumes that the selection of one of the proposed crude oil pipeline systems has not been made and that no new port facilities or crude oil pipeline as proposed by the applicants would be constructed pending permit approval or disapproval. The delayed decision of permit approval or denial for the proposals may result in no other alternative system being initiated pending the decision. Therefore, the effects of a delayed action could be similar to that of no action for the length of the delay. Conversely, the delayed decision could accelerate the consideration of other alternatives, which if implemented, could eliminate the need for any of the four proposals. Delaying action on selecting any of the applicants' proposals would allow the Department of the Interior to gather additional environmental data for further analysis. This would permit a more thorough impact analysis of the four proposals.

Alternatives of Northern Tier Pipeline Company

Port Facility

Cherry Point. At Cherry Point there are two existing refineries with associated tanker berths and storage facilities. Use of this alternative site would require two additional berths, increased onshore storage and a 66-mile pipeline to the vicinity of Arlington, Washington where it would join the proposed route. Environmental impacts in this area which is already being used for crude oil transshipment would be less significant than in a relatively less developed area. The risks of oil spills would be increased but not introduced. In March the most probable impact area due to an oil spill would be to the coast from Birch Point to Cherry Point and under certain conditions to Orcas Island, Lucio Island, and Matia Island. Also, East Point on Saturna Island, Canada would be threatened. Oil spills during September would tend to travel rapidly to the northwest into Canadian waters. Construction impacts along the pipeline right-of-way would be minor, local, and generally of short duration.

Construction or expansion of crude oil tanker unloading facilities at Cherry Point is prohibited by the Marine Mammal Protection Act of 1972 as amended in 1977. This site could be a viable alternative only if the Act were amended, deleting the prohibition.

Burrows Bay. The Burrows Bay alternative would require construction of a sea island-type berth, submarine pipelines to storage tanks built onshore and a 38-mile pipeline to the vicinity of Arlington, Washington where it would join the proposed route. Environmental impacts would be significant because of negligible current industrial development in the area and the presence of important marine and terrestrial resources. Oil spill risks would represent a new potential for environmental impacts in the area. Water quality at the entrance to Rosario Strait and Burrows Bay is excellent (Class AA). Shorelines that could be impacted during an oil spill are Allan's Island, Burrows Bay, Iceberg Point to Decateur Head, and Smith Island. Oil spills would degrade water quality in the bay and adjacent straits. Along the pipeline right-of-way there would probably be only minor local impacts of short duration.

Construction of a crude oil transportation facility at Burrows Bay is prohibited by the Marine Mammal Protection Act of 1972, as amended in 1977. This site could not be an alternative unless the legislation were changed.

Freshwater Bay. This alternative would require construction of two single point mooring systems for offloading crude oil from tankers, submarine pipelines to shore, onshore storage facilities and 17 miles of pipeline to reach the proposed pipeline route south of Green Point. The impacts from construction of the terminal facilities would be significant because there is relatively little development in the area at this time. Impacts related to the pipeline segment would probably be minor, local, and temporary. Preliminary oilspill risk and spill trajectory analyses indicate that marine oil spills at this port site during March or September would initially impact a region between Tongue Point and Ediz Hook.

Low Point. NTPC selected this site as its primary alternative port site. It would require two single point moorings, submarine pipelines to shore, and onshore storage facilities. Twenty-eight miles of pipelines and one additional pump station would be required to connect this marine terminal to the proposed pipeline route. Construction and routine operation impacts would probably be similar to those for the Freshwater Bay alternative.

An oil spill in March would have an initial impact zone between Deep Creek and Crescent Rock. Due to a frequently observed cross channel current, the initial impact zone might include Parsons Point to Cape Calves, and the Sooke Basin, Canada. Oil spills in September could initially impact the coastline somewhere between Pillar Point and Crescent Rock and those areas impacted in a March spill due to cross channel currents.

Onshore Storage Facility

The primary alternative site for the onshore storage facility, is located approximately 4.6 miles from the tanker unloading facility on Ediz Hook. This site meets all criteria for an onshore storage facility site. The topography, soil conditions, and drainage of this approximately 545 acre site are suitable for construction of onshore tanks and related facilities.

This site located west of the proposed Green Point site, is primarily forested, with a small agricultural/pasture area of approximately 92 acres in the northern central portion. The onshore storage facility would be compatible with existing land uses if it were sited away from a nearby residential area and if steps were taken to preserve wooded areas as a screen and buffer.

The environmental impacts of the alternative site would be similar to construction impacts of the proposed site at Green Point. However, the alternative could conflict with Clallam County land use plans and zoning. Construction of the submarine pipelines could be in conflict with the Clallam County Shoreline Master Program.

Route Segment Alternatives

Around Puget Sound. This route was originally selected by NTPC as the proposed route but later designated an alternative. The around Puget Sound pipeline segment would originate at the onshore storage facility on Green Point in Clallam County, Washington and continue around Puget Sound and intersect the proposed pipeline route at North Bend, Washington. The route segment would be 198 miles long compared to 128 miles for the proposed route. The route segment would cross seventeen major streams in the Puget Sound Basin. The state of Washington has classified eight of these streams class AA, indicating excellent water for all beneficial uses. Much of this route segment is in an area of high scenic quality and visual sensitivity. Recreational activities within this route segment are extensive.

Coeur d'Alene, Idaho. This alternate departs from the proposed route near Spangle, Washington, travels northeast passing south of Spokane, Washington and proceeds north of Coeur d'Alene, Idaho, joining the proposed route near Kingston, Idaho. This was originally selected by NTPC as the proposed route but was later designated as an alternative because of environmental problems and public opposition. It would cross approximately 25 miles of the recharge area of the Spokane-Rathdrum aquifer which has been declared a "sole source aquifer" by the Environmental Protection Agency (1978). This designation prohibits any action which could result in a potential hazard to public health. This segment would be 12 miles longer than the proposed route. Potential impacts would be essentially comparable to those which would occur along the proposed route, except for the potential impacts on the Spokane and Coeur d'Alene water supply.

Coeur d'Alene River, Idaho. This route segment was examined by NTPC as an alternate to the proposed route. This route segment goes between Kingston and Delta, Idaho. The route follows the Coeur d'Alene River and would cross it twelve times in 23 miles. Construction of numerous river crossings and the potential of an oil spill into the river would be significant along this route segment. The route segment would be six miles longer than the proposed route.

Driveway Ridge, Montana. This alternative departs from the proposed route near Thompson Pass, follows a ridge northward, and then east on Driveway Ridge following a Forest Service road. The route segment is four miles longer than the proposed route. The route alternative lies entirely on National Forest land. The route would affect significantly fewer recreationists than the proposed route.

Flathead Indian Reservation, Montana. NTPC originally proposed to cross the Flathead Indian Reservation. Refusal by the Flathead Indian Tribal Council required NTPC to change the proposed route to the Siegel Creek-Ninemile Creek area between Plains and Missoula, Montana. This route is 9 miles shorter than the proposed route. It would have greater impacts on recreational activities and wildlife habitat and would have less impact on visual and mineral resources than the proposed route.

Knox Pass-St. Regis-Frenchtown, Montana. The Montana Department of Natural Resources proposed this route segment which leaves the proposed route near Thompson Falls, Montana and rejoins it west of Missoula, Montana. The purpose was to avoid environmental impacts and public opposition on the proposed route through Ninemile Valley. The route segment is 11 miles longer than the proposed route. Adverse impacts to surface water and fisheries would be greater along this alternative route segment because of the amount of encroachment on streams and the number of creek crossings. There would be less impacts to terrestrial wildlife on the alternative route than on the proposed route.

South Fork Coeur d'Alene River, Idaho. The State of Idaho, environmental groups and private citizens requested BLM to consider an alternate route segment along the South Fork Coeur d'Alene River. BLM has proposed a route segment from Kingston, Idaho, paralleling the South Fork Coeur d'Alene River to Montana, along the St. Regis River to St. Regis, and then along the Clark Fork River rejoining the proposed route west of Missoula. Major environmental advantages would be the avoidance of impacts across National Forests, aquatic impacts along Prospect Creek, public opposition through Ninemile Valley, and impacts on the Clark Fork River. Major disadvantages would be engineering feasibility, limited right-of-way in Wallace and Mullan, unknown public opposition and the potentially higher cost of pipeline construction. The proposed and alternate unit segments are approximately the same length (116 miles versus 118 miles).

Ninemile Valley, Montana. This route segment leaves the proposed route at Siegel Pass, traverses Lolo National Forest land above Ninemile Creek and rejoins the proposed route east of Frenchtown, Montana. This alternative was proposed to reduce the mileage of the proposed route across private lands in the Ninemile Valley area between Seigel Pass and Missoula, Montana. The alternative route segment would cross 25 miles of federal and state lands, and 7 miles of private land compared to 11 miles and 22 miles, respectively, for the proposed route. Although terrestrial wildlife impacts are greater on the alternative route segment, fishery impacts are greater on the proposed route due to proximity to rearing streams for salmonids.

Milwaukee Railroad, Missoula, Montana. The Missoula Planning Board requested NTPC, who in turn requested BLM, to examine the feasibility of using the existing Milwaukee Railroad right-of-way rather than the proposed route due to the Milwaukee Railroad's future plans to abandon all rail facilities in western Montana. The route segment leaves the proposed route west of Frenchtown, Montana and joins the railroad right-of-way near Huson, Montana. The route would continue on abandoned railroad right-of-way through the city of Missoula, Montana and rejoin the proposed route near Bonner, Montana. The purpose is to avoid the route crossing Rattlesnake Creek, and area of public significance, and to use the proposed pipeline right-of-way (formerly the railroad right-of-way) through Missoula as a parkway that would have recreational and aesthetic value. The alternate route (28 miles) is approximately the same length as the proposed route (26 miles). Since 25 miles of the 28 miles would be located on abandoned railroad right-of-way, impacts to private land use would be diminished. However, potential pipeline leaks could contaminate Missola's water supply.

Missoula-Garrison-Helena, Montana. This route segment would start at Missoula, Montana, follow Interstate 90 to Garrison, and then state highway 12 joining the proposed route at Helena, Montana. NTPC originally proposed this route segment as an alternative to crossing the Flathead Indian Reservation. This alternative route

segment is 14 miles longer than the proposed route. Impacts to recreationists would be significantly greater along this route segment compared to the proposed route.

Helmville-Great Falls, Montana to Tioga, North Dakota. The Montana Department of Natural Resources developed this route segment as an alternate to the proposed southern route. Beginning near Helmville, Montana this route segment travels northeast across the Helena National Forest, bypassing Great Falls on the west, continuing northeast across private lands and then leads eastward to the Montana border. BLM considered this recommended route segment and continued it into North Dakota, paralleling the existing portal pipeline and rejoining the proposed route south of Tioga. The route segment is 120 miles longer than the proposed route. Impacts on surface water resources along this alternative would be less significant than those along the proposed route. The route segment crosses a BLM wilderness study area that is being recommended for intensive study. A pipeline would be precluded from crossing the area during the time it is being studied and if it is placed under wilderness status.

Helmville-Lewistown-Mosby, Montana. This route segment begins near Helmville, Montana, continues northeast to a point south of Great Falls, past Lewistown, and rejoining the proposed route at Mosby, Montana. The route segment would be 56 miles longer than the proposed route. Impacts on surface water and fisheries resources would likely be less significant along the alternative route segment.

Harlowton, Montana-Beach, North Dakota - Clearbrook, Minnesota. This segment was originally the proposed route, but became an alternative when NTPC changed to a northern route paralleling the Portal Pipeline. The route segment begins at Harlowton, Montana, travels in a northeasterly direction and enters North Dakota five miles south of Beach. The route segment continues northeasterly passing north of Bismarck, North Dakota. The route continues in an easterly direction entering Minnesota near the town of Shelly and then on to the delivery facilities at Clearbrook, Minnesota. The route segment is 63 miles shorter that the proposed route. Short-term impacts to soil productivity, disturbance of aquatic resources at numerous stream crossings and construction across wetlands and prairie pothole areas would be significant environmental impacts along this route. Crossing the Little Missouri Grasslands, a National Wildlife Refuge, waterfowl production areas, and other natural areas would be critical enivronmental effects of using this alternative route segment. The route segment would cross the Terry Badlands in Montana which is being studied by BLM for its wilderness characteristics. The route segment would adversely impact the Lake Aggasiz Dunes Natural Area in Minnesota. Fisheries impact would be greater along the alternative route than the proposed route.

Grand Forks, North Dakota. The North Dakota Planning Division in Bismarck requested BLM to include an alternate route segement bypassing north of Grand Forks, North Dakota and East Grand Forks, Minnesota to avoid environmental impacts upon the city's water supply, to reduce impacts upon prime agricultural lands, and to eliminate one major river crossing of the Red Lake River. The route segment is three miles longer than the proposed route. The alternative would reduce potential construction impacts upon water quality and resident fisheries. The route segment would also eliminate the potential for crude oil contamination of the Grand Forks city water supply.

Alternatives of Northwest Energy Company

Port and Onshore Storage Facilities

Skagway Ore Wharf. It is technically feasible to upgrade the existing ore wharf to receive 120,000 dead weight tonnage (dwt) tankers. The berthing slip has limited maneuvering space and its use would create some traffic congestion problems for other vessels which utilize the port area. The present volume of ore carrier traffic, plus the size and frequency of tanker arrivals, would increase the level of berth occupancy in excess of 60 percent. Even if tankers arrive on schedule, a berth occupancy in excess of 60 percent makes ship demurrage a source of concern. Moreover a large scale dredging operation would be required that would involve the removal of a substantial amount of contaminated material (lead and zinc) and the location of a suitable site for its disposal.

Single Point Mooring. This alternative requires a swing radius of approximately 2,000 feet. In order to provide the swing diameter which the tankers require, the mooring device would have to be placed in the center of the 6,000-foot wide channel. Channel depth at this point averages 450 feet which is too deep for efficient operation of the mooring device. In addition, a single point mooring cannot match the high unloading capacity of a shore-based terminal, and is more vulnerable to oil spill incidents due to the presence of long floating and submerged flexible oil lines.

Yakutania Point. This alternative, differing in terms of location from the preferred alternative, presents several problems which would limit its feasibility. There would be a need to utilize property currently designated as a city park and the extreme steepness of the harbor bottom could pose some potential problems in wharf construction.

Haines. Haines, Alaska is located on Portage Cove near the north end of Chilkoot Inlet. It is the point of origin for the Haines Road to the Alaska Highway and a petroleum pipeline to Haines Junction.

The city of Haines is built on a narrow, low-elevation neck on the Chilkoot Peninsula. Otherwise, its physical setting is somewhat similar to that of Skagway.

In this alternative the port facility would be constructed adjacent to deep water at Haines and the oil would either be transferred to barges or pumped through an underwater pipeline and transported 15 miles to Skagway.

Both transportation methods would involve oil spill risks not present in the primary proposal. The additional handling required by barge transport would almost certainly increase the frequency of routine oil spills and the probability of a major spill. Moreover, additional tankage at Haines would be required.

A Haines-Skagway pipeline located in the bottom of Taiya Inlet may be subject to additional risks of underwater slides, particularly those that might be triggered by earthquake movements disturbing the steep front of the submerged portion of the Skagway River delta. Leak detection and repair would be considerably more difficult in the case of an underwater pipeline in a fjord of more than 600 feet depth.

Yakutania Point Onshore Storage Facility. Yakutania Point would be the only other possible site in the Skagway area for location of the onshore storage facility. However, the slope is relatively steep in this area and the terrain is rough. Storage tanks would need to be benched and notched into the side of the mountain. Part of the site area is within city limits and part is under the jurisdiction of the federal government. A portion of the city owned sections is currently designated as a city park.

Route Segment Alternatives

Skagway-Carcross Highway. A route following the Skagway-Carcross Highway was evaluated as an alternative to following the proposed route along the White Pass and Yukon Railroad right-of-way. The alternative route segment would require less hillside cutting, no crossing of the Skagway River, and no disruption of service to the existing CANOL pipeline and White Pass and Yukon Railroad. The alternate route segment would disrupt highway traffic during the summer tourist season. The route segment would parallel the highway for 14 miles in Alaska and 5 miles in Canada where it would rejoin the proposed route. From this point the route could either continue to follow the highway or parallel the railroad right-of-way.

Skagway-Edmonton. The Skagway to Edmonton route would be identical to the previously described Skagway to Keg River route, up to Kledo Creek. At this point, the proposed oil line route to Edmonton would continue to follow the Alaska Highway Gas Pipeline route through British Columbia in a southeasterly direction and would pass to the northeast of Prophet River. The route would continue in a more easterly direction from this point, crossing the Sikanni Chief River. This crossing would be 3.5 miles south of the confluence of the Sikanni Chief River and Trutch Creek. The Beatton River would be crossed and the route would proceed across the British Columbia-Alberta border.

From British Columbia-Alberta border, the route would continue to follow the Alaska Highway Gas Line passing approximately 6 miles south of the community of Spirit River and about 5 miles north of Braeburn.

The route would then diverge from the proposed gas line route and head east, joining highway 43 and continue to follow the highway to the point where it turns south. The proposed oil line would continue east, passing to the north both Volmer and Namao before turning south to Edmonton.

No environmental analysis of this alternative has been made.

Delta Junction System. In this alternative system, 500,000 barrels per day of Prudhoe Bay oil would be diverted from the Alaska Pipeline into the Northwest Energy Corporation storage facilities at Delta Junction, Alaska. From Delta Junction, Alaska to the vicinity of Squanga Lake, Yukon, Canada the proposed alternative route would parallel the approved natural gas pipeline route in close association with the Alaska highway, and then continue to Keg River, Alberta, Canada. The oil would then be transported through existing systems to Edmonton, Alberta, Canada and ultimately through existings to markets in the United States.

A Delta Junction to Keg River connection would result in 1,119 miles of new main line, with some 85 miles constructed in the above-ground mode. Because this alternative has no connection for offshore oil supplies, the project would be entirely dependent on Prudhoe Bay supplies of crude oil.

Alternatives of Kitimat Pipe Line, Ltd

KPL identified four alternative ports and routes to move crude oil via pipeline from the West Coast of British Columbia to Edmonton for consideration in the preliminary stages of the project. The Bella Coola alternative, the Ridley Island alternative, and the Port Simpson alternative were all rejected due to marine conditions and therefore did not become serious land route alternatives.

KPL selected the port of Kitimat as the most feasible for port-pipeline system which is the proposal. No alternatives have been analyzed.

Alternatives of Trans Mountain Oil Pipe Line Corporation

Port and Onshore Storage Facilities

Cherry Point. At Cherry Point, Washington there are two existing refineries with associated tanker berths and storage facilities. Use of this alternative site would require two additional berths, increased onshore storage, and a new 30-inch pipeline from Cherry Point to Edmonton, Alberta, Canada.

Environmental impacts in this area which is already being used for crude oil transshipment would be less significant than in a relatively less developed area. The risk of oil spills would be increased. During March conditions the most probable impact area due to an oil spill is the coast along Cherry Point. Under certain conditions Orcas Island, Sucia Island, and Matia Island would be threatened. An oil spill in September would tend to travel rapidly to the northwest and into Canadian waters. A large in-transit or at berth oil spill would present serious pollution problems in the Strait of Georgia. Construction impacts along the pipeline right-of-way would be minor, local, and generally of short duration.

Construction or expansion of crude oil tanker unloading facilities at Cherry Point is prohibited by the Marine Mammal Protection Act of 1972 as amended in 1977. This site could be a viable alternative only if the Act were amended.

Burrows Bay. The Burrows Bay alternative would require construction of a sea island-type berth, submarine pipelines to storage tanks built onshore at March Point in Skagit County, Washington. From March Point a new 30-inch pipeline would be built to Edmonton, Alberta, Canada.

Environmental impacts would be significant because of negligible current industrial development in the area and the presence of important marine and terrestrial resources. Oil-spill risks would represent a new potential for environmental impacts in the area. A March oil spill would initially impact the shorelines of Allan and Burrows Islands and all the shoreline of Smith Island. During September conditions an oil spill would essentially impact the same areas. Along the pipeline right-of-way there would probably be only minor local impacts of short duration.

Construction of a crude oil transportation facility at Burrows Bay is prohibited by the Marine Mammal Protection Act of 1972, as amended in 1977. This site could not be a possible alternative unless the legislation was changed.

Port Angeles. This alternative would utilize a fixed tanker berthing facility on Ediz Hook and an onshore storage facility on Green Point in Clallam County, Washington. The berthing facility and storage facility would be connected by two

submarine pipelines. During March conditions the most probable impact area due to an oil spill is the Olympic Peninsula coastline from Dungeness Spit to an area near Pillar Point. In September conditions an oil spill would spread westward along the coastline from Port Angeles to the Clallam Bay area. An advantage of the Port Angeles port site is that it would reduce tanker exposure to adverse weather and sea conditions. Conversely, the proposed port site, Low Point, is preferable from an in-transit risk standpoint by not exposing the Port Angeles harbor area to the increased risk of oil spills.

Route Segment Alternatives

Port Williams, Whidbey Island, Camano Island. This alternative pipeline route segment would depart from the proposed route near Morse Creek and head northeast then east to the Port Williams area. A 14-nautical-mile submarine crossing of the eastern Strait of Juan de Fuca would then be made to Point Partridge on Whidbey Island. On the Island, the route would head north-northeast to a point north of Oak Harbor and south of the U.S. Naval Reservation, and then west to a location near Strawberry Point. A submarine crossing of Saratoga Passage to Brown Point on Camano Island would then be made. The pipeline route would then head southeast to Stanwood, where it would join the proposed route. This alternate route would be 6 miles shorter than the proposed route. A submarine pipeline rupture would significantly degrade water quality throughout the eastern part of the Strait of Juan de Fuca, Dungeness Spit and Bay, Sequim Bay, Discovery Bay, San Juan Archipelago, and Admiralty Inlet.

Around Puget Sound. This alternative route segment would leave the proposed route near Fairmont, Washington and continue around Puget Sound to North Bend, Washington continuing north and rejoining the proposed route at Stanwood, Washington. The around Puget Sound route segment would be 187 miles longer than the proposed route (225 miles in length compared to 38 miles for the proposed route). The alternative route segment would have potentially more environmental impacts than the proposed route due primarily to the greater distance of pipelines required. Future decisions by the state of Washington may eliminate consideration of any pipeline route across Puget Sound, necessitating the need for the around Puget Sound alternative.

Other Crude Oil Transporation Systems

Long Beach, California; Midland, Texas; and Midwest (SOHIO)

SOHIO Transportation Company of California proposed this system, consisting of port facilities and storage at Long Beach, California, and a 1,027 mile pipeline combining new segments (237 miles) with the reversal of an existing gas pipeline (790 miles) to Midland, Texas. The proposed throughput would be 700,000 barrels per day of which 200,000 barrels per day would remain in the Los Angeles area with 500,000 being transported via the pipeline to Midland, Texas.

Critical environmental impacts could result from marine oil spills and air quality deterioration in the Long Beach vicinity, and from new transmission lines across undisturbed desert country. There could also be adverse impacts on terrestrial and aquatic resources from construction across the Colorado River, other major streams and fragile desert habitat.

The Department of the Interior approved the permit for crossing federal lands. SOHIO was seeking approval for state permits when, on March 13, 1979 the company announced abandonment of the project primarily due to economics and a decreased west coast oil surplus. On June 20, 1979 SOHIO withdrew the right-of-way application filed under Title I, Mineral Leasing Act, with the BLM, Department of the Interior.

Trans-Mexico Pipeline

The Barber Oil Company has proposed a system consisting of a tanker terminal with onshore storage at Salina Cruz, Mexico, a pipeline with 1.75 million barrels per day capacity for 165 miles across Mexico to another terminal constructed at Coatzacoalcos, Mexico, on the Gulf Coast. Tankers would then deliver the crude oil to the United States ports on the Gulf Coast.

There would be the risk of marine resource impacts similar to other proposals using marine transportation routes. Construction impacts along the pipeline corridor are not known. The proposal is considered to be in early planning stages. No applications for permits have been made to the U.S. or Mexican Governments. Mexico would require 60 percent ownership of the project which eliminates United States control.

Trans-Guatemala Pipeline

The Central American Pipeline Company has proposed a system with single point moorings for tanker unloading onshore storage facilities at Buena Vista on the Pacific Coast and Puerto Barrios on the Caribbean Coast of Guatemala, and a connecting pipeline 227 miles long. Tankers would then transport the crude oil to U.S. ports. The system is designated for an initial throughput of 600,000 barrels per day with a maximum throughput of 1.5 million barrels per day. Risk of marine resource impacts would be similar to other systems using sea routes. There are no known data about possible impacts along the pipeline corridor.

The company has a preliminary agreement with the Guatemalan govenment, but the project may conflict with the provision of the Trans-Alaska Pipeline Authorization Act which requires United States control of the transportaion of Alaskan crude oil. This project is considered to be in the early planning stages.

Panama Canal and the Mid-Continent Pipeline System

West Coast crude oil could reach United States ports on the Gulf of Mexico and the east coast by tanker around Cape Horn or through the Panama Canal. Either tanker route would have to utilize the Mid-Continent Pipelines to reach the northern tier states.

The Mid-Continent Pipelines consist of a network of pipelines which transport foreign and domestic crude oil to redistribution centers and refineries throughout the mid-continent region. Most of these lines are operating at nearly full capacity but there is capability for expansion by about 875,000 barrels per day (DOE 1978). No pipeline company has indicated the intention to expand its system at this time.

If larger tankers (200,000-290,000 dwt) become available to transport crude oil from Valdez, the route around Cape Horn could require fewer tanker trips and could reduce the frequency of lightering to smaller tankers for passage through the Panama Canal, this reducing oil-spill risks. However, hazardous navigation around the Cape would add to the tanker casualty risk.

Transshipment of crude oil through the Panama Canal involves 80,000 to 250,000 dwt tankers transporting crude oil from Valdez to Panama, off-loading to 65,0000 dwt vessels that can pass through the canal and continue to the Gulf Coast ports. It is estimated by the Department of Energy that the capacity for this alternative is 500,000 barrels per day.

Lightering at the canal would increase emissions of hydrocarbon vapors and the oil-spill risks inherent in additional loading and unloading operations. Using smaller tankers also increases total tanker traffic.

The Mid-Continent Pipelines could move oil to some of the northern tier states under any of the alternate tanker systems that deliver oil to Gulf Coast ports. In the absence of specific proposals analysis of environmental impacts is not possible.

Northville Panama Transshipment

Northville Industries have proposed constructing a transshipment port at Puerto Armuelles, Panama. It would be designed to receive large tankers from Valdez, and would include storage tanks from which the oil would be reloaded into shuttle tankers for passage through the Panama Canal and then to Gulf ports. It is planned for initial throughput of 425,000 barrels per day. It would be capable of future expansion to about 900,000 barrels per day depending on capacity of Panama Canal.

Environmental impacts would occur from port construction of the terminal and increased traffic on the Panama Canal. Operational impacts would be potential oil spills in the marine environment and increased air quality impacts. Crude oil delivered to the Gulf Coast ports could be transported through the Mid-Continent Pipelines which were described above.

Unit Trains

Unit train transport has been proposed as a short-term alternative to transport the surplus flow of north slope crude oil and supply the refineries in Montana. The General American Transportation Company (GATX) and the Burlington Railroad proposed the unit train system in 1977. Although the specific project is presently inactive, the unit train system will be considered as an alternative.

The proposed port facility is Port Westward, Oregon, an 850-acre existing U.S. Army fuel depot, as western terminus for unit trains. The port can presently accommodate 30,000 to 35,000 dwt tankers, and unloading facilities can transfer about 35,000 barrels of oil per day. Dredging to accommodate larger tankers up to 75,000 dwt and expansions of unloading facilities to transfer up to 48,000 barrels per day was proposed. Approximately two to five tankers would call at the port each month.

Approximately every two days a unit train consisting of about 90 oversize tank cars with a total capacity of 50,000 barrels per train would deliver oil to the Continental Pipeline at Cutbank, Montana to supply the Billings, Montana area refineries.

Environmental impacts include possible oil spills in the Columbia River, construction and operation of the Port Westward terminal and unit train shipment near sensitive areas in Oregon, Washington, Idaho, and Montana.

Other Alternatives

There are several alternatives not requiring a new west to east pipeline that would reduce or negate the need of the proposed projects. Although, individually they do not accomplish the purpose of the proposed projects, arranged in different combinations and proportions they could provide an almost unlimited number of actions that could accomplish the same purpose. These can be discussed in three major categories: Those that reduce the surplus on the west coast; other sources of supply; those that would reduce the projected demand for crude oil in the northern tier states.

Reduce West Coast Surplus

Of the 1.2 million barrels per day that was being delivered by Trans Alaskan Pipeline (TAPS) in May 1979, 440,000 barrels per day was surplus to the demand on the west coast and was shipped to the Gulf Coast.

It should be understood that the surplus of heavy ANS crude on the west coast is only surplus or in excess of the refinery preference for the type of crude they wish to process. This preference is determined by the design of the refinery and the demand for the mix of refined products in the area. Because of this refinery preference, large amounts of light foreign crude are imported into the west coast.

Retrofitting of existing refineries to process heavier crudes or the construction of new refineries is an expensive undertaking. Conversions could be done and this is an action that would reduce the excess of heavy crudes on the west coast.

Exchange of ANS for foreign crude that could be delivered to U.S. ports more economically has been proposed by the state of Alaska and others. This is prohibited by the Alaska Pipeline Act (Public Law 93-153) unless the President determines that it will not diminish the quantity or quality of the petroleum available to the United States and is otherwise in the national interest. The state of Alaska proposal would involve the exchange of ANS crude with Mexico. The ANS crude would be shipped to Japan and the Mexican crude would be delivered to Gulf Coast ports. The shipping cost would be reduced because of the short distance from the west coast of Mexico to the Gulf ports and the economy of using large tankers for shipment from Valdez to Japan.

One method of eliminating the west coast surplus would be to reduce the production of ANS crude to the level of west coast demand. While this reduces the transportation costs and provides the lowest cost storage it would increase the United States dependence on foreign crude, adversely affect the balance of payments, reduce income to the state of Alaska and the owners of the oil and the pipeline.

Other Sources of Supply

There are several other actions or combination of events that would supply the Northern Tier states with additional crude oil to meet the transportation deficit that is projected. It is possible the Canadian government could change or modify its plans to curtail exports of crude oil to the United States by 1982. There is no indication that this is going to happen, but if it did that would relieve all or much of the projected deficit. Additional imports from any country would be counter to this country's policy of energy independence and would adversely affect the balance of payments.

There is not believed to be substantial new opportunities for crude oil discoveries in the northern tier area. If the price of oil continues to increase, oil shale and more expensive secondary and tertiary recovery methods may be financially feasible. If new discoveries are made they would provide an alternative to the proposed project. It is also possible to change the existing transportation patterns in the mid-continent area to supply different refineries. Redirection of crude supplies would relieve individual refinery deficits, but because there is little idle capacity in mid-continent pipelines, redirection only serves to redistribute the deficit unless new pipelines are constructed. New pipelines from the Gulf ports would relieve a large amount of the transportation deficit and supply refineries in many, but not all, of the northern tier states.

Unit trains have also been proposed to connect to the Continental Pipeline at Cutbank, Montana to supply the Billings area refineries. The proponent General American Transportation Corporation does not see this proposal as an alternative to a major west to east pipeline, but rather as a short term alternative for the Montana refineries.

Reduced Demand

A final series of actions or events that would reduce the need for the proposed projects would be to reduce the demand for crude oil in the northern tier states. Further conservation of petroleum products would reduce demand. It must be understood that in all of the projections for demand, conservation has been taken into account. The accuracy of these projections is dependent on the validity of the assumptions that were used in determining them. Factors that could induce additional voluntary conservation would include; 1) increase of the conservation ethic, 2) reduction of the supply of products to force conservation by inconvenience or denying access by the supplier, 3) increased conservation as a result of a higher price on products, 4) mandatory conservation by government actions.

It is possible for governmental actions to stimulate conservation. Opportunities range from a policy of not repairing or improving the highway system to the subsidy of mass transit to conserve gasoline. The National Energy Conservation Policy Act of 1978 provides 1) utility conservation program for residences, 2) weatherization grants for low income families, 3) solar energy loan programs, 4) energy conservation loan programs, 5) grant programs for schools and hospitals, 6) energy audits for public buildings, 7) appliance efficiency standards, and 8) civil penalties relating to automobile fuel efficiency. These types of programs can be increased or expanded to encourage conservation. Finally, mandatory government controls such as rationing or prohibiting the use of petroleum for certain purposes would reduce the projected deficit.

Importing petroleum into the northern tier states would reduce demand for crude oil in these states but without state refineries and product pipelines and it would only relocate the projected deficit. In combination with other actions discussed previously, it could serve as a tool to relieve specific geographical shortages.

The substitution of other energy sources for petroleum products would also reduce the projected deficit. This could be encouraged by governmental action or could occur voluntarily because of a price imbalance between sources of energy.

CONSULTATION AND COORDINATION

The Bureau of Land Management has consulted with federal, state, and local agencies as well as private companies and individuals concerning the development of the environmental statement. Consultation with governmental agencies helped to insure proper coverage of all topical areas in the final Environmental Statement (ES) and to minimize duplication of work. Public comment and participation were encouraged in the development of the ES.

Data was collected by the BLM environmental statement team, five contractors, and eight federal agencies which had agreements with BLM. Many state, county, and local agencies also assisted BLM in gathering data.

A committee was established to coordinate activities between federal, state, and local agencies. The goal of this committee was to coordinate the preparation of the ES so that it would meet, to the greatest extent possible, the needs of the other permitting agencies. This committee met twice during the initial phase of development of the DES. A preliminary draft ES (PDES) was distributed to the committee and a meeting was held to jointly consider the comments on the PDES. The committee also met to discuss the status of the project on June 13, 1979.

It was the intent of the environmental statement team to promote public participation at all stages of the project. The goals were to maximize public involvement throughout the entire environmental statement process and to insure that public inputs and concerns were effectively considered and incorporated in the ES. A toll free number (800) 547-5532 provided the public with easy access to the environmental statement team throughout the preparation of the statement.

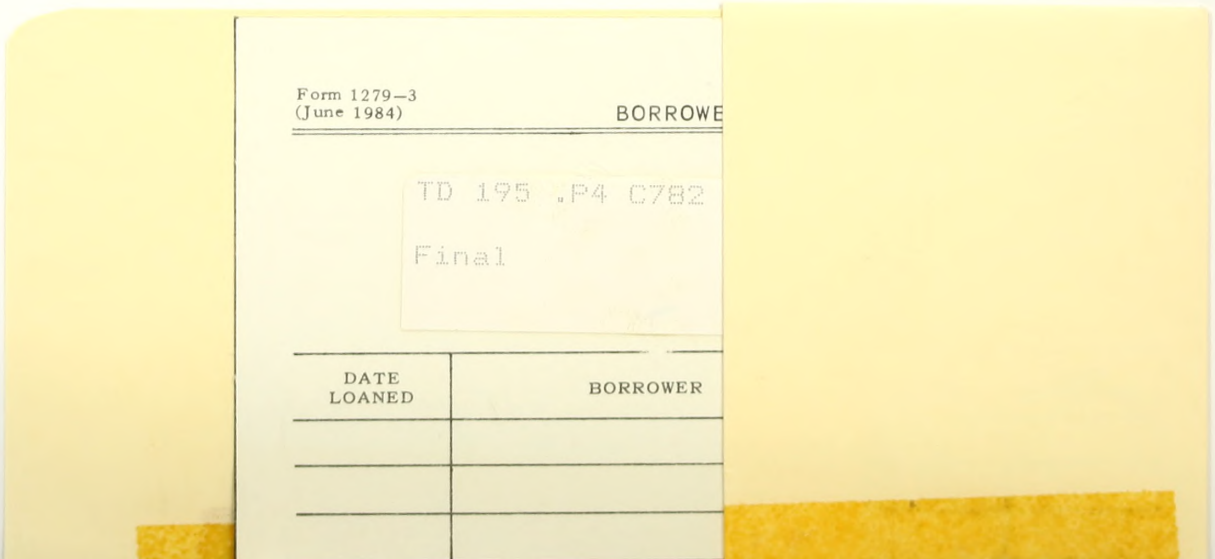
The environmental statement team has consulted and coordinated with those agencies having jurisdiction or special expertise according to the requirements of the Fish and Wildlife Coordination Act, National Historic Preservation Act, Endangered Species Act, and other applicable acts relating to the proposals of NTPC, NEC, and TMC.

The draft ES was issued January 11, 1979. A total of 1,500 copies were printed and mailed to interested individuals and organizations as well as numerous federal, state, and local agencies.

A period of 81 days was allowed for the public to respond on the draft ES. All written comments submitted by April 2, 1979 were responded to in the final ES. Comments submitted after April 2 were considered, but responded to only if from a federal agency.

Public Hearings

Public hearings were held between March 6 and March 21, 1979. The purpose of the hearings was to receive testimony on the draft ES, as it related to the requirements of the National Environmental Policy Act of 1969. All testimony was recorded and transcribed. The following summarizes the participation at public hearings.



Form 1279–3
(June 1984)

BORROWE

DATE LOANED	BORROWER

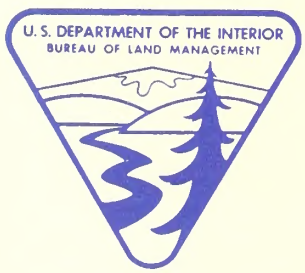
Date	City	Approximate Number Persons Attending	Number of Persons Presenting Oral Testimony
March 6	Coeur d'Alene, ID	35	6
March 6	Billings, MT	30	8
March 7	Helena, MT	45	8
March 7	Glendive, MT	45	5
March 8	Missoula, MT	140	33
March 8	Williston, ND	35	4
March 12	Ephrata, WA	35	8
March 13	Crookston, MN	15	5
March 13	Olympia, WA	50	10
March 14	Minot, ND	25	4
March 14	Seattle, WA	55	12
March 15	Bismarck, ND	30	10
March 15	Port Angeles, WA	150	51
March 19 and 21	Juneau, AK	35	10
March 20	Skagway, AK	110	20

Most of the testimony submitted at the hearings did not address the adequacy of the draft ES, but rather stated opposition to or support for one or more of the proposals. The most significant concerns were voiced at the Missoula, Port Angeles, Seattle, and Skagway hearings. The consequences of oil spills and leaks, air quality degradation and the consequences of fires and explosions, if one of the proposals was implemented, were the primary items of concern.

A total of 250 letters were received commenting on the draft ES. The environmental statement team responded to approximately 2,300 individual comments in the final ES.

Lynx

* GPO 698-636


U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT


U. S. DEPARTMENT OF THE INTERIOR
March 3, 1849